National Register of Historic Places Continuation Sheet

Name of Property

County and State

Section number ______ Page ______

Name of multiple property listing (if applicable)

SUPPLEMENTARY LISTING RECORD

NRIS Reference Number: 95001161 Date Listed: 10/23/1995

Property Name: Piers and Revetments at grand haven, MI

County: Ottawa State: MI

This property is listed in the National Register of Historic Places in accordance with the attached nomination documentation subject to the following exceptions, exclusions, or amendments, notwithstanding the National Park Service certification included in the nomination documentation.

Signature of the Keeper

8/9/2010
Date of Action

Amended Items in Nomination:

Section 5: Resource Count

The nomination is hereby amended to include three(3) contributing structures.

The original submission neglected to count or describe the Inner and Outer Pierhead lights, or the catwalk connecting them to the shore. The cast iron lights, constructed in 1905, and the steel catwalk are integral structures to the historic function and design of the piers.

The Michigan State Historic Preservation Office was notified of this amendment.

DISTRIBUTION:

National Register property file
Nominating Authority (without nomination attachment)

1161

NPS Form 10-900
(Oct. 1990)

OMB No. 10024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name: Piers and Revetments at Grand Haven, Michigan

other names/site number:

2. Location

street & number: Mouth of Grand River ☐ not for publication

city or town: Grand Haven ☐ vicinity

state: Michigan code: MI county: Ottawa code: 139 zip code: 49417

3. State/Federal Agency Certification

As the designated authority under the National Historic preservation Act, as amended, I hereby certify that this ☑ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☑ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☐ statewide ☑ locally. (☐ See continuation sheet for additional comments.)

A. Foster Engineer Corps Federal Preservation Officer, 9.7.95
Signature of certifying official/Title Date

State or Federal agency and bureau

In my opinion, the property ☒ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Kathryn B. Eckert SHPO 11-30-93
Signature of certifying official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is:

☑ entered in the National Register.
☐ See continuation sheet.
☐ determined eligible for the National Register.
☐ See continuation sheet.
☐ determined not eligible for the National Register.
☐ removed from the National Register.
☐ other, (explain:)

Signature of the Keeper: Entered in the National Register

Date of Action: OCT 23 1995

5. Classification

Ownership of Property
(Check as many boxes as apply)

- [ ] private
- [ ] public-local
- [ ] public-State
- [x] public-Federal

Category of Property
(Check only one box)

- [ ] building(s)
- [ ] district
- [ ] site
- [x] structure
- [ ] object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
		buildings
		sites
4	0	structures
		objects
4	0	Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register

0

6. Function or Use

Historic Functions
(Enter categories from instructions)

TRANSPORTATION/water-related

Current Functions
(Enter categories from instructions)

TRANSPORTATION/water-related
RECREATION/outdoor recreation

7. Description

Architectural Classification
(Enter categories from instructions)

OTHER: No style

Materials
(Enter categories from instructions)

foundation wood piles, steel sheeting, stone
walls
roof
other wood, stone, steel sheeting, concrete,

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

The U.S. Army Corps of Engineers navigation structures, including two piers and two revetments, are located at the mouth of the Grand River in the harbor at Grand Haven, Ottawa County, Michigan. The piers and revetments protect the mouth of the Grand River; the northern pier extends 1,414 ft, and the southern 1,495 ft. The channel is 300 ft wide and 23 ft deep from Lake Michigan to a point 1,000 ft inside the pier ends. From that point to 0.5 mi upriver, to the Grand Trunk Railroad Bridge at Ferrysburg, the width of the channel remains at 300 ft, while the depth is reduced to 21 ft. The revetments guarding the margin of

(Continued)

Narrative Description

the ship channel at this point extend for 2,159 ft along the north bank and for 3,674 ft along the south bank. An 18 ft deep turning basin lies just below the south side of the bridge. Upriver from the turning basin to Spring Lake (3,100 ft), the channel narrows to a width of 100 ft and is dredged to a depth of 18 ft (Figure 1). From Spring Lake for a distance of 14.5 mi the channel is 100 ft wide and 8 ft deep.

The U.S. Army Corps of Engineers (COE) owned piers and revetments possess composite substructures consisting of stone filled timber cribs, close driven round timber piles and wood plank sheet piles reflective of upwards of 19 construction episodes carried out over the 62-year period between 1857 and 1919. Virtually the entire substructure is presently covered with a steel sheet pile facade set in place between 1951 and 1983 (Figures 1 through 5). The exceptions to this include a 1,164 ft segment (Section P) of the south revetment and two segments (Sections D and G) of the north revetment totaling 556 ft in which the original wood pilings respectively dating to 1872-75/1910-11, 1873-74, and 1918 construction phases remain evident (Figures 1, 3, and 5). These elements are, however, largely obscured by the slab concrete superstructure built along the piers and revetments between 1916 and 1938. This superstructure element has generally been adapted to the post-1950 reconstructure episodes conducted along the piers and revetments.

A schedule of the various construction-reconstruction episodes for the COE-owned Grand Haven piers and revetments can be presented as follows:

Construction Schedules

Structure	Section	Length (ft)	Substructure	Superstructure	Repaired
North Pier	A-1	55	1894	1921	1953
	A	648	1887, 1889, 1891, 1894	1921	1953-55
	A-2	106	1894	1921	1952
	B	605	1875, 1877-79	1922	1957-58
		1,414 (Total)			
North Revetment	C	9	1873-74, 1932	1932	1957
	C-1	191	1873-74, 1932	1932	1957, 1983
	D	406	1873-74	1932	---
	E	677	1873-74, 1911	1938	1981
	F	726	1917-18	1917-18	1931-32, 1963
	G	150	1918	1918	---
		2,159 (Total)			

Construction Schedules (cont.)

Structure	Section	Length (ft)	Substructure	Superstructure	Repaired
South Pier	H	119	1893-94	1921-22	1957
	H-1	632	1883-85, 1887, 1891-93	1921-22	1954
	I	348	1882-84	1919-20	1951-52, 1957
	J	78	1868-69, 1919-20	1919-20	1957, 1959-60
	J-1	31	1868-69, 1919-20	1919-20	1957, 1959-60
	K	287	1867-68, 1916-67	1916-67	1959-60
		1,495 (Total)			
South Revetment	L	315	1857-58, 1884, 1908-09	1935	1972
	M/M-1	452	1857-58, 1910-1	1935	1972
	N	353	1857-58, 1916-18	1916-18	1963
	O	324	1857-58, 1916-18	1916-18	1963
	P	1,164	1872-75, 1910-11	1936-37	---
	Q	26	1910-11	1933	1972
	R-1	73	1910-11	1933-34	1972
	R-2/R-3	260	1857-58, 1910-11	1935	1972
	R-4/R-5	394	1857-58, 1910-11	1935	1972
	S	477	1910-11	1930	1962
	T	136	1910-11, 1914	1930	1962
		3,674 (Total)			

(U.S.A.E.D.D. 1993)

Piers and Revetments at Grand Haven, Michigan
Name of Property

Ottawa, Michigan
County and State

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

☐ **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.

☐ **B** Property is associated with the lives of persons significant in our past.

☒ **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values,or represents a significant and distinguishable entity whose components lack individual distinction.

☐ **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria considerations
(Mark "x" in all the boxes that apply.)

Property is:

☐ **A** owned by a religious institution or used for religious purposes.

☐ **B** removed from its original location.

☐ **C** a birthplace or grave.

☐ **D** a cemetery.

☐ **E** a reconstructed building, object, or structure.

☐ **F** a commemorative property.

☐ **G** less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)

Engineering

Period of Significance

ca. 1857-1935

Significant Dates

1857

1867

1916

Significant Person
(Complete if Criterion B is marked above)

Cultural Affiliation

Architect/Builder

Detroit and Milwaukee Railroad

U.S. Army Corps of Engineers

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

9. Major Bibliographical References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):
- ☐ preliminary determination of individual listing (36 CFR 67) has been requested
- ☐ previously listed in the National Register
- ☐ previously determined eligible by the National Register
- ☐ designated a National Historic Landmark
- ☐ recorded by Historic American Buildings Survey # ____________
- ☐ recorded by Historic American Engineering Record # ____________

Primary location of additional data:
- ☐ State Historic Preservation Office
- ☐ Other State agency
- ☐ Federal agency
- ☐ Local government
- ☐ University
- ☐ Other

Name of repository:

U.S. COE Office-Grand Haven; U.S. COE Office-Detroit

10. Geographical Data

Acreage of Property 8.16 acres

UTM References
(Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing
1	16	701200	5152760
2	16	700895	5153330
3			
4			

☐ See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title C. Stephan Demeter/Historical Archaeologist and Historian; Kathryn C. Egan/Archaeologist

organization Commonwealth Cultural Resources Group, Inc. date October 6, 1993

street & number 2530 Spring Arbor Road telephone 517-788-3550

city or town Jackson state Michigan zip code 49203-3602

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps

A **USGS map** (7.5 or 15 minute series) indicating the property's location.

A **Sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs

Representative **black and white photographs** of the property.

Additional items
(Check with the SHPO or FPO for additional items)

Property Owner

(Complete this item at the request of SHPO or FPO.)

name U.S. ARMY CORPS OF ENGINEERS
DETROIT DISTRICT

street & number POST OFFICE BOX 1027 telephone

city or town DETROIT, MI 48231-1027 state zip code

Paperwork Reduction Act Statement: This information is being collected for application to the National Register of Historic Places to nominate properties for listing or determine eligibility for listing, to list properties, and to amend existing listings. Response to this request is required to obtain a benefit in accordance with the National Historic Preservation Act, as amended (16 U.S.C. 470 *et seq.*).

Estimated Burden Statement: Public reporting burden for this form is estimated to average 18.1 hours per response including time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding this burden estimate or any aspect of this form to the Chief, Administrative Services Division, National Park Service, P.O. Box 37127, Washington, DC 20013-7127; and the Office of Management and Budget, Paperwork Reductions Projects (1024-0018), Washington, DC 20503.

Narrative Statement of Significance

Engineering Significance (Criterion C)

Technological Overview (General)

The opening of the upper Great Lakes region to a more intensified range of settlement had, by the early 1850s, led to accelerated commercial growth. In addition to increases in the mainstays of agricultural production and logging, this period also witnessed the emergence of the extractive mineral industries of Lake Superior and the development of urban consumer-production centers along the south shores of Lakes Erie and Michigan. The opening of the St. Mary's Ship Canal and the modification of the Welland Canal were important manifestations of this early phase of regional development. Whereas the former project provided direct access to the mining district of Lake Superior, the latter established a direct shipping link between the Great Lakes ports with those along the Atlantic seaboard and Europe (Strickland 1860:340). As an adjunct to the increasingly important role of ship navigation in regional economic growth, harbor construction took on a new significance. While federal involvement in port development projects on the upper Great Lakes had begun as early as the mid-1830s at St. Joseph on Lake Michigan, and at Monroe on Lake Erie, it was not until the early 1850s that these efforts were extended beyond simple channel clearing operations and began to manifest themselves in construction projects aimed at creating refuges along an otherwise largely unprotected coastline (Larson 1981:24).

An integral element of harbor construction activities on the Great Lakes was the creation of pier and breakwater barriers serving as shelter for shipping and the protection of dock and wharf facilities that might otherwise be directly exposed to wave and ice damage. Because of the occurrence of numerous protected harbors along the Atlantic coast the need for breakwater construction, and the prerequisite technology, had been of minimal importance to harbor engineering in the United States up through the early nineteenth century (Strickland 1826). It was not until the needs of a greatly expanded Great Lakes shipping trade began to require extensive harbor improvement projects that direct experience in this field was initiated. According to one turn-of-the-century source, it was directly due to this situation that "...the design and construction of breakwaters... [had]...reached a high [stage of] development" in the United States (Wright 1914:699). The largest proportion of this work was the product of federally legislated United States Army Corps of Engineers activities.

Breakwater design on the Great Lakes since the mid-nineteenth century has depended on a variety of compositional elements, ranging from the use of timber cribbing, wood sheet and timber pilings, concrete, driven steel sheeting, and stone rubble. Variations in design fabrication have been numerous over the past 150 years. While these transitions can ultimately be traced to technological innovations ongoing in the construction trade during this period, other important factors relate directly to per unit costs, the local availability of supplies, function, and environmental stress factors.

The fact that jetties and breakwaters are virtually identical in terms of composition and design, and are nominally categorized under the general heading of pier structures, has tended to create a certain amount of confusion in structure identifications (Wright 1914:699). As defined in the field of marine engineering, jetties and breakwaters are distinguished, in part, according to their placement in relation to the shore (Wright 1914:699). A far more important element serving to segregate the two structural types is associated with their intended functions. These are categorized as follows:

Breakwater

A breakwater is a structure employed to reflect and/or dissipate the energy of water waves and thus prevent or reduce wave action in an area it is desired to protect. Breakwaters for navigation purposes are constructed to create sufficiently calm waters in a harbor area, thereby providing protection for the safe mooring, operating, and handling of ships and protection of shipping facilities. Breakwaters are sometimes constructed within large, established harbors to protect shipping and small craft in an area that would be exposed to excessive wave action. Offshore breakwaters may serve as aids to navigation and/or shore protection, and differ from other breakwaters in that they are generally parallel to and not connected with the shore.

Jetty

A jetty is a structure, generally built perpendicular to the shore, extending into a body of water to direct and confine a stream or tidal flow to a selected channel and to prevent or reduce shoaling of that channel. Jetties at the entrance to a bay or a river also serve to protect the entrance channel from storm waves and crosscurrents, and when located at inlets through barrier beaches jetties also serve to stabilize the inlet location [United States Department of the Army (U.S.D.A.) 1986:1-3].

Within the Great lakes the usage of the term "jetty" has traditionally been dropped in favor of the more generic designation of "pier" when referring to protective structures at channel mouths. While this may actually reflect a variable in design function, the origin of this usage can likely be traced back to the terminology employed in the enabling legislation authorizing the various federal harbor improvement projects in the region.

During the past century, numerous innovations have been adopted in pier (i.e., breakwater/jetty) construction on the Great Lakes. To a large extent, these transitions have reflected a delicate balance between factors of need and cost. One example representative of this approach can be seen in the relatively low occurrence of the stone rubble moles, almost universally adapted in Europe and the Mediterrian for breakwater construction since the Classical period. Prior to 1940, its use in the upper Great Lakes, above Lake Erie, was limited to no more than 7,082 ft of free-standing structure, of which more than half (3,949 ft) had been erected between 1910 and 1913; at Ashland and Marquette harbors on Lake Superior; and Mackinac Island Harbor at the north end of Lake Huron (United States Army Engineer District, Detroit [U.S.A.E.D.D] 1986). The use of stone as ballast in timber crib breakwater construction was common throughout the nineteenth century. At soft-bottom harbor sites, it was also deposited as a barrier along the base of the breakwater to prevent scouring or undercutting of the substructure. At locations possessing hard clay or rock bottoms, stone was often employed as a foundation material for timber crib piers which as a result could be extended further into deeper waters than would normally have been possible with the use of crib-work alone. In addition to the above uses, stone was also employed as a shock absorbing sloped barrier on the lakeward side of the breakwaters (Figure 6). In some instances, stone rubble has been laid up along the harbor facing walls or carried up over the top of the original substructure (Figure 7). This approach to breakwater construction reflects one of several employed since the 1910s in rehabilitation projects aimed at stabilizing and improving the earlier dating timber crib or pile substructures. These efforts have led to the creation of composite structures exhibiting the profile of a rubble mound but possessing diverse core elements indicative of prior building phases.

In addition to stone and concrete rubble mounds, the use of interlocking steel sheet piling has widely been employed since its apparent initial use as part of the north breakwater at Port Washington Harbor in 1934 (U.S.A.E.D.D. 1986).

This material has been employed both in new construction projects and in the rehabilitation of existing pier substructures. In the latter instance, the "replaced" structure forms the core element of the new structure. Since the late 1940s, the use of steel sheet pile cells, ovate to circular in horizontal cross section, has also been employed in breakwater/jetty construction. These units are customarily filled with combinations of stone, sand, or dredged spoil.

The use of cast-iron sheet piling was first employed during the construction of the Liverpool Dock in 1825. Its use in the United States did not occur for another two decades, when it was employed during the construction of the lighthouse at Brandywine Shoal on Delaware Bay (Kirby and Laurson 1932:258). Its use in the Great Lakes was minimal until the post-World War II period.

In general, the use of wood in harbor construction activities on the Atlantic seacoast of North America was pervasive up through the beginning of the nineteenth-century (Norman 1987). These early works took the form of timber cribs or consisted of vertically driven round timber piles with horizontal planking nailed along the inner side of the piles (Norman 1987:13). Both structure types were generally filled with either rock or soils derived from a variety of sources. Early nineteenth-century pier and bulkhead expansions along the Detroit waterfront indicate an ongoing use of such facilities as a disposal site for community wastes (Demeter and Weir 1987).

The use of driven round timber pile bulkhead supports had become fairly common in New York City wharf construction by the late 1830s (Hunt 1840:313; Norman 1987:21). Its use in wharf and jetty construction was a common feature of port development on the Great Lakes by the close of the following decade (Farmer 1890:816). In addition to stone and earthen fills, the use of wood scrap sawmill wastes was also a unique feature of regional construction techniques. As late as 1906, this approach was employed during the construction of 555 ft of the west pier of Port Wing Harbor (Lake Superior). While the use of such structures in breakwater development was minimal, one attempt utilizing this material was made in setting up 7,363 ft of substructure at Ashland Harbor (Lake Superior) between 1889 and 1894 (Figure 8). The end result was less than desired, leading to the capping of the entire structure, between 1908 and 1910, with an improvised dredge spoil and stone rubble mound (Figure 7).

Out of a total of 80 harbor projects presently under the jurisdiction of the U.S. Army Corps of Engineers, Detroit District, 37 (46.3 percent) exhibit breakwater/jetty elements consisting of timber cribbing. With few exceptions, the bulk of these are now encased as core elements within modified substructures. The timber crib substructure represents the dominant pier form employed throughout the Great Lakes during the nineteenth century. Their continued use into the present century can be documented at 17 locations within the Detroit District; the last of these being associated with the development of the south breakwater at Manistee (Lake Michigan) between 1913 and 1920 (U.S.A.C.E. 1916; U.S.A.E.D.D. 1986). The timber crib was referred to as the simplest substructure employed in breakwater/jetty construction which, by the opening of the twentieth century, was reported to be used "only in minor harbors or under primitive conditions" (Wright 1914:700). The crib substructure was constructed on-shore of hewn logs, floated into position and sunk in place with the addition of stone. The interior of the crib was divided into compartments formed by transverse and longitudinal timber walls with some of the compartments being floored with wood planking in order to receive the stone ballast at the time of sinking. The remaining compartments were subsequently filled to provide additional stability with the individual units being fixed in place with bar and strap iron. The above-water superstructure was next completed with a continuation of timbers or planking, or a combination of both. Unlike the substructure which normally consisted of pine or hemlock (Gary Frankish, personal communication 1993), oak represented the preferred material for the superstructure element and for guard fenders along the structure (U.S.A.C.E. 1883:1706; 1889:2172, 2193). These works normally extended from 5 ft to 10 ft above water level and generally featured a sloping face to the lakeward side designed to deflect the impact of wave forces. The degree of slope, as well as the overall superstructure design of the different works, tended to vary dependent on anticipated wave stresses, the availability of materials, and, to some extent, project specific experimentation. One innovative approach designed for the breakwater at Frankfort Harbor (Lake Michigan) in 1882 called for the construction of a centrally positioned, longitudinally raised element consisting of 12 in × 12 in timbers (Figure 9). A more substantial design was adapted to the superstructure of the east breakwater built in Cleveland in 1887. The superstructure element of this pier was described as having been:

> ...carried up vertically for only 2 ft above water level and was then inclined at an angle of 1 on 2.5 until it attained a height of 10 ft above the water surface on the lake side. From that point it was horizontal until it met the harbor face which was vertical (Wright 1914:700).

This configuration was later modified during the construction of the breakwater at Presque Isle in 1897 in order to accommodate the heavier seas produced on Lake Superior. In this instance, a sloping deck of 6 in × 12 in plank was constructed on the timber superstructure set at 0.5 ft above the low-water datum on the lakeward (parapet) side and extending to 10 ft high on the inner (banquette) harbor facing side. Lacking the flat top of the Cleveland breakwater, the Presque Isle superstructure was designed to allow "...the waves to slide over the work and fall down vertically inside, with a minimum of impact and resistance" (U.S.A.C.E. 1897:2638) (Figure 10).

Vertical iron strapping was added to the lakeward facing side of both the Cleveland and Presque Isle structures in order to anchor the superstructure to the substructure.

The use of a composite breakwater was first attempted in 1882 at Oswego, New York (Lake Ontario). In this instance, a concrete mortared cut stone deck was added as the superstructure to a timber crib substructure. This procedure was quickly abandoned when it became apparent that the flexible crib provided an extremely poor foundation to this variety of masonry work. By the close of the century the substitution of wood and cut stone with massed concrete as the primary constituent of superstructure construction was introduced at Buffalo and Cleveland harbors on Lake Erie.

The use of timber crib substructures in breakwater/jetty construction on the Great Lakes had been adopted in part due to its traditional usage in pier construction and the ready availability of timber and plank; however, crib piers were easily damaged in collision, and suffered from sand and ice erosion. Wave action similarly affected these structures both as a result of direct impact forces against the crib substructures, which often led to structural displacement, and the movement of the fill stone within the crib works. The wedgelike action of smaller stones similarly tended to place additional stress on the timber frame of the crib, either abrading the walls or separating its timber components. Weathering at the water line between high and low lake level horizons also represented a significant problem. By the turn of the twentieth century, it was postulated that timber crib breakwaters had an "average life...[of]... about 15 years" (Wright 1914:700). In effect, they were not designed as permanent structures, but only as stop-gap elements employed to meet the immediate needs of harbors or refuges whose long-term requirements were indeterminant. In all probability, the boomtown atmosphere that necessitated harbor development around lumber and ore shipping centers was viewed as a short-term need likely to evaporate as production in these extractive industries decreased.

In order to reduce maintenance requirements on crib structures, certain procedures had been employed by the U.S. Army Corps of Engineers as public pier facilities began to fall under their jurisdiction during the mid-nineteenth century. Many of the crib structures completed by individuals and municipalities prior to this period had been set in place without adequate foundation preparation. These were, in some instances, anchored in place with the use of riprap mounded along the lakeward and (often) harbor facing walls. By the 1880s, crib components associated with soft-bottom harbor locations were consistently placed on driven round timber pilings with riprap laid along the base to prevent scouring. By the 1890s, those associated with hard-bottom locations were generally fixed on a foundation of small core stone with the upper elements of the substructure being secured with sloped riprap.

In addition to transitions in foundation and superstructure design implemented during the last quarter of the nineteenth and first quarter of the twentieth centuries, the crib substructures were themselves subject to certain modifications. This feature of breakwater/jetty design was most pronounced with regard to crib size. While widths tended to range anywhere from about 20 ft to 35 ft, lengths were fairly standardized. During the third quarter of the nineteenth century, the use of a 32 ft length seems to have been most common (U.S.A.C.E. 1867:153; 1876:469; Wright 1914:700). In the 1880s, crib length was increased to a more or less standardized 50 ft setting (U.S.A.C.E. 1883:1704; 1889:2171). By the 1910s, during the terminal phase of timber crib construction usage, the standard length had increased to 100 ft (U.S.A.C.E. 1916:3032).

The use of concrete as a protective element added to timber crib and stone rubble piers was initially employed during the reconstruction of the mole at Cherbourg completed in 1850 (Hamilton 1958:466). Between 1870 and 1872, a stone rubble breakwater extending for 9,675 ft was constructed at Alexandria, Egypt. This structure ranged up to a maximum of 60 ft in depth, on which a layer of armor stone was placed along the seaward side consisting of 20-ton concrete blocks (Vernon-Harcourt 1891:194). Both projects featured the use of concrete as a superstructure element. In the Cherbourg example, the cement composition utilized was described as "hydraulic lime" capable of hardening below water, while that associated with the construction of the Alexandria breakwater consisted of Portland cement blocks molded on shore and either barged or craned into place.

The shallow water breakwater constructed at Aberdeen Harbor employed both cement varieties. Begun in 1871, the base of this structure consisted of unmixed hydraulic lime placed in sack cloth bags ranging from 50 tons to 100 tons, which were barged into place and sunk to form the foundation. These were laid to within 2 ft above the low water datum and conformed to the uneven harbor bottom prior to setting (Vernon-Harcourt 1891:202-203; Wright 1914:702). The superstructure consisted of a megalithic concrete wall composed of Portland cement deposited in mass within a timber framed mold. The resultant wall measured approximately 23 ft in height and 42 ft at the base, constricting to 30 ft in width at the top. It was surmounted by a 6 ft parapet wall facing to the seaward side (Figure 11).

These advances in the use of concrete composition walls had a rapid impact on engineering standards practiced in the United States. One factor of prime importance in establishing this trend was the securing of a patent for the production of an artificial Portland cement in the United States by David O. Saylor in 1871. Saylor's cement was later specified by the federal government for use in the construction of the South Pass jetties at the Mississippi Delta. Built between 1875 and 1879, the east jetty of this project extended for 1 mi in length with the west jetty running for 0.5 mi in distance. Both were composed of megalithic concrete blocks, the largest of which weighed 260 tons, measuring 5 ft × 13 ft × 55 ft (Condit 1960:228).

The growth of the cement industry in the United States during the succeeding decade took advantage of a discovery made in about 1875 that utilized slaked blast furnace slag in the manufacture of an "adulterated" variety of Portland cement (Burchard 1914:759; Condit 1960:227; Thorpe 1898:483-485). Its use, in combination with slaked lime, was also widely employed in the manufacture of artificial puzzolanic cements employed in underwater work (Burchard 1914:760). When correctly ground as a sharp particle aggregate, slags were also utilized as a substitute for quartz sands in concrete production (Baker 1894:79). This material typically consisted of 6 to 8 parts of slag aggregate to 1 part of cement (Condit 1960:227-228). The increased importance of concrete as a construction material in North America can be seen to correlate with increases in iron ore production. During the 16-year period between 1856 and 1872, the cumulative production of iron ore from the Lake Superior region was estimated at 5,567,373 tons (Tuttle 1873:575). This figure represents slightly less than 17 percent of the total iron ore tonnage that passed through the Soo Locks alone in 1905, amounting to 34,353,456 tons (Dunbar 1965:503).

The adaptation of concrete in pier construction in the Great Lakes remained limited until the closing decade of the nineteenth century, when it began to emerge as a preferred material in superstructure construction and rehabilitation activities associated with timber crib breakwaters and jetties. Among the earlier of the projects of this type carried out by the U.S. Army Corps of Engineers on the Great Lakes was the reconstruction of the "old breakwater" superstructure in Buffalo Harbor built in 1887/89 (Baker 1894:543; U.S. Army Engineer District, Buffalo [U.S.A.E.D.B.] 1989) (Figure 12). The composition employed in this instance was described as a "natural cement concrete," a low temperature calcinated limestone generally referred to as Roman cement (Burchard 1914:759).

The general configuration of the Buffalo breakwater superstructure was subsequently adopted in the rehabilitation (1898) of the West Breakwater superstructure in Cleveland Harbor (Wright 1914:701; U.S.A.E.D.B. 1989). In this instance, the timber crib substructure was removed to a point approximately 3 ft below mean water level and capped by three parallel lines of precast Portland cement concrete blocks, each measuring 4 ft × 4 ft × 8 ft. The open spacing between the blocks was filled with stone and the entire structure capped with a 5 ft thick banquette deck surmounted on the lake facing side by a sloped 5 ft high concrete parapet (Figure 13).

Within the present boundaries of the Detroit District Corps office, the superstructure of the Marquette Harbor breakwater represents a significant innovation in the use of mass concrete construction design. Rather than employing a raised outer parapet on the lake facing side, this portion of the superstructure exhibits an offset bileveled sloping face designed to break up the heavier wave forces produced on Lake Superior. Built between 1896 and 1905 on a timber crib substructure, this work entailed the placement of two parallel coarses of precast concrete sill blocks (rectangular in cross section) positioned atop the outer and inner crib walls with the space between being filled with stone. This was surmounted by a mass concrete deck structure standing a maximum of 8.4 ft above the foundation blocks on the harbor side. In addition to the offset lakeward slope face, this superstructure also featured an enclosed gallery walkway within the harbor side of the structure (Figure 6).

The conversion from wood plank and timber to concrete pier superstructures remained an ongoing feature of breakwater and jetty reconstruction projects for the next half century. During this same period, another innovation took place in the substitution of smooth surfaced concrete sill blocks (Figure 13) with recessed surface blocks designed to reduce the potential of shifting that might result from storm action, collision or decomposition of the timber substructure. This was initially introduced during the reconstruction of the main breakwater at Harbor Beach, on Lake Huron, in 1905 (Wright 1914:702; U.S.A.E.D.D. 1986) (Figure 14). Another development that occurred during this period was the introduction of the reinforced concrete caisson as a substitute for the timber crib substructure. Having first been introduced during the construction of the Algoma breakwater (Lake Superior) in 1908, these caissons measured 24 ft × 20 ft × 18 ft with 10 in thick vertical walls and a 14 in thick floor (U.S.A.C.E. 1908:1954). These were manufactured on-shore and floated to the construction site where they were sunk along the alignment of the proposed breakwater/jetty locations that had been prepared with wood piles. The caissons were next filled with stone riprap and capped with a concrete deck. This structure type was initially reinforced with 6 in × 6 in horizontal timbers and 12 in × 12 in vertical support posts along the interior walls. This element was further secured by the placement of transverse and longitudinal walls composed of 6 in × 6 in timbers that served to subdivide the structure into four compartments (Figure 15). The arrangement was similar to that of the timber crib which the concrete caisson was designed to replace. This usage presumably also lent itself to the adoption of the erroneous designation for the concrete caisson as being a "concrete crib" (Wright 1914:703).

As with the timber crib, the vertical wall configuration of the original concrete caisson design accepted the full impact of wave forces that invariably led to a certain amount of shafting of the substructure. This was compensated for by the use of riprap stone mounded along both the lakeward and harbor facing sides of substructure (U.S.A.E.D.D. 1986). The rectangular cross-sectioned concrete caisson was last employed during the construction of the Sheboygan Harbor breakwater (Lake Michigan) in 1913-15. During the construction of the south breakwater (Lake Michigan) extension at Racine Harbor (Lake

Michigan) in 1917-19, a sloped wall concrete caisson design was introduced. These had the advantage of not only deflecting the force of wave impacts, but also required lesser volumes of stone fill within the caisson module. This latter feature, combined with the utilization of sand as an alternative ballast fill served to reduce the material cost of construction.

The use of concrete caissons in breakwater/jetty construction on the Great Lakes was limited to Lake Michigan within the boundaries of the defunct Milwaukee District office; since absorbed by the Detroit District. Out of a total of 80 harbor projects presently under the jurisdiction of the Detroit District, only 9 (11.25 percent) exhibit the usage of concrete caissons in breakwater/jetty construction. The latest of these occurred in conjunction with a 540 ft extension of the north breakwater at Kewaunee Harbor in 1936-37 (U.S.A.E.D.D. 1986).

Historic Overview (Site Specific)

Euroamerican settlement at Grand Haven was initiated with the establishment of the American Fur Company headquarters at this location in 1827. With the disbanding of this operation several years later, in the face of intensified immigration to the Michigan Territory, the former company agents Rix Robinson and John Stuart acquired title to the property under the name of the Grand Haven Company in 1834. During the next two years the settlement grew to "upwards of 400 inhabitants", boasting "three steam sawmills... ...six spacious warehouses" and a regular trade in passengers and timber established by lake vessel with Chicago (Blois 1839:291; Fuller 1916:438). Several years later, in 1838, the Federal government constructed a lighthouse on the south lakefront side of the Grand River and in 1844 surveyed the channel mouth and lake bottom leading to the upriver port facility (Lillie 1980:203; Linebaugh 1984:2). A pier was later built to the lighthouse to arrest lake erosion. Damaged as a result of storm action this structure was subsequently abandoned with a new facility being completed on a more elevated ground location in 1855 (Linebaugh 1984:3).

In the 1840s, the number of sawmills at Grand Haven had increased to six with a capacity of 60,000 ft of lumber per day (Lillie 1980:232). The lumbering industry in Ottawa County gained its greatest momentum beginning in the 1850s. From 1850 to 1860, the number of sawmills in Grand Haven increased to 10, with a total capacity of more than four times that of the mills operating the previous decade. Lumber was to play a leading role in the development of Grand Haven for years to come (Lillie 1980:195-196, 301; Rubenstein and Ziewace 1981). The 1860s represented another boom period for Grand Haven's lumber industry. By 1862, two million board feet were being shipped weekly from Grand Haven. The city's most important mills at that time were E. L. Fuller & Company, Cutler & Savridge Lumber Company, Dennison, John Haire, F. T. Ranney, Becker, Spoon & Thompson, and Ferry & Sons (Lillie 1980:302, 305). By 1867, the mills were beginning to find it increasingly difficult to meet the demands for their product. Although pine was becoming scarce by this era, a market for hardwoods had opened with maple, oak, and elm being in high demand (Lillie 1980:317).

It was at the time of the reconstruction of the lighthouse that a significant shift in Grand Haven's potential as a port facility took place. This began with the consolidation of two competing railroad lines, the Oakland and Ottawa Railroad and the Detroit and Pontiac Railroad, under the name of the Detroit and Milwaukee Railroad in February 1855. By its very name this new corporation aimed at developing a direct railroad route between Detroit and the fast growing commercial center on Wisconsin's Lake Michigan shore. Rather than circumventing the lake with a bypass through Chicago, the railroad proposed to develop a more direct route employing a car ferry service between Grand Haven and Milwaukee. This move was accomplished during the next three years with the first through train with passengers from Milwaukee arriving in Detroit in September 1858 (Farmer 1890:894). Although a plan for the port at Grand Haven had been developed by Col. J. D. Graham of the U.S. Topographical Service in 1857, it was to be almost another decade before the U.S. Army Corps of Engineers (COE) became directly involved in harbor construction and maintenance activities (U.S. Army Corps of Engineers [U.S.A.C.E.] 1867:99). While the COE annual report for 1867 notes that Grand Haven represented "...a lumber market of some importance", the primary reason for COE involvement rested on Grand Haven's importance as "...being one terminus of the Detroit and Milwaukee Railroad, and on an extensive line of communication between east and west" (U.S.A.C.E. 1867:109). A later COE report also noted that in addition to its importance in relation to railroad/lake commerce Grand Haven also held "...a special status as a harbor of refuge..." (U.S.A.C.E. 1890:2646).

Through the River and Harbor Act of June 23, 1866, the COE was authorized to implement Col. Graham's earlier recommendations which called for the protection of a concave bend along the south bank of the Grand River with close piling and the construction of two parallel piers at the mouth of the river extending into Lake Michigan (U.S.A.C.E. 1867:99). By this time, however, the Detroit & Milwaukee Railroad Company had already built a 3,185 ft long pier on the southern side of the harbor entrance. This was a pile and slab pier set at an angle of 11° more to the west than the direction originally recommended by Col. Graham. The orientation of the pier and mode of construction were faulty. Numerous piles had been washed out by the current, allowing sand to wash into the channel. Therefore, an alternative design, to that proposed by Col. Graham, was implemented. This plan called for filling the unprotected gap between the wharves and existing pier, and for extending the pier with timber cribs for 600 ft in a line with the existing alignment. In addition, the plan proposed that the north pier begin about 50 ft south of the location designated by Col. Graham and run in a line parallel to his until it was opposite the angle of the south pier, at which point the orientation should be shifted to parallel the south pier and extend until they were of equal length (U.S.A.C.E. 1867:101).

Prior to the commencement of the proposed work, repairs were completed on the south pier. Three hundred and nine feet of the pier had been burned by a fire, started by sparks from the steamboat *Detroit*. The COE had initiated repairs to the pier because the damage increased the likelihood of a breach that would interfere with the channel. The repairs were completed in 1867, and entailed cutting down the piles to water level, driving them in further, and placing timber cribbing atop the piles, filling them with wood slabs and stone (U.S.A.C.E. 1867:100).

Throughout the 1870s, funds were appropriated by the U.S. Government for further improvements to the port (U.S.A.C.E. 1873:38, 1876:101-102; Lillie 1980:329, 324). These improvements included: repairs to the piers; construction of 700 ft of pile revetment, replacing the old railroad work; strengthening the pierhead; and dredging the shoals that had filled in the channel. In addition, construction on the north pier was initiated and plans were established to construct a revetment along the bend in the river (Figures 2-5) (U.S.A.C.E. 1873:38, 1876:101-102). By 1880, the USACE work had resulted in the establishment of a 400 ft wide channel with a depth varying between 9 ft and 23 ft (U.S.A.C.E. 1880:217).

The Corps of Engineers continued to maintain and improve the harbor structures at Grand Haven through the 1880s. Harbor improvements included extending the dock from the foot of Clinton Street to the south pier and enclosing what was known as "Government Pond," thus narrowing the river channel (Lillie 1980:357-358).

Construction efforts during the 1880s were focused primarily on the piers. Both piers were expanded to afford greater protection to the harbor and reduce the shoaling of sand into the channel from the current. These extensions were of timber crib construction built on a pile foundations (Figures 4 and 5). The revetments were also repaired and refurbished (Figure 2). This work involved both relatively minor repairs and refilling and rebuilding of small segments of the superstructure (U.S.A.C.E. 1890:2647). In 1879, shoaling in the channel had reduced traffic and resulted in the wreck of three vessels (U.S.A.C.E. 1880:2020). During the 1880s, in an effort to further deter the encroachment of dune sand into the channel was also attempted. Fences were built along the shoreline (U.S.A.C.E. 1890:2647; Lillie 1980:354). Thousands of trees and other beach plants were planted along the shoreline to further stabilize the coast (U.S.A.C.E. 1880:2020; 1890:2647)).

In 1890, the piers were set 400 ft apart. The north pier projected about 1,120 ft beyond the shoreline with the south pier extending approximately 1,300 ft into the lake. The channel between the piers and into the river ranged between 18 ft and 24 ft in depth (U.S.A.C.E. 1890:2649). Despite the improvements to the harbor, there were serious problems with bars developing beyond the piers that reduced the width of the channel at the entrance to the harbor. Given these difficulties and the importance of maintaining the port, recommendations were made to extend the piers (the north pier 600 ft and the south pier 550 ft), to extend and repair the revetments inside the harbor entrance, and to adopt measures that would arrest the inflow of sands from the shore, riverbank, and the dunes (U.S.A.C.E. 1890:2647) (Figure 16). The proposed construction of the piers to their full extent was completed in the 1890s (Figures 4 and 5).

To further improve the safety of the harbor for shipping and navigation, a light was added on the south pier in 1881 shedding a beacon that was visible for 8 mi to 10 mi (Figure 16). This was a considerable improvement over the private light that was erected on a cross pole, on the north pier, and was only visible for 2 mi to 3 mi (Lillie 1980:363).

Shipping records from the late nineteenth and early twentieth centuries reflect the growing importance of this port as a transportation and commercial center. During the year of 1866, there were 8,000 vessel entries and departures carrying a total of 18,000 tons of cargo in and out of the harbor (U.S.A.C.E. 1867:102). Trade in grain assumed considerable significance in Grand Haven during the 1870s. In 1874, for example, one line of steamers delivered 330,271 barrels of flour, 1,183,2686 bushels of wheat, and 37,000 bushels of oats, corn and rye to Grand Haven (Lillie 1980:341). By the late 1880s, tonnage had increased to annual amounts of between 632,159 tons (fiscal year 1887) and 1,450,600 tons (calendar year 1888). Goods received and shipped during 1889 included grain, flour, produce, iron, hardwood and other merchandise and exports included lumber and lumber products, pig iron, produce, flour and other merchandise amounting to 649,370 tons (U.S.A.C.E. 1890:2648).

While these early accounts fail to segregate freights which were destined for local consumption, or derived from local production, from those which were simply being transshipped between Milwaukee, Chicago and Detroit, some inkling into the size of this variable is provided during the early part of the succeeding century. In 1912, for example, of the 802,356 tons of freight (valued at $56,963,534) handled out of the port of Grand Haven upwards of 91 percent was itemized as "through traffic" (U.S.A.C.E. 1912:1147). The following decade, in 1921, it was calculated that of the 598,814 tons of cargo (valued at $46, 123,000 handle at Grand Haven Harbor a full 95 percent represented "through traffic" items (U.S.A.C.E. 1922:1544).

The decreases in both tonnage and cargo values handled by the port in 1921 were attributed to the declining usage of the car ferries and other vessels for the transport of goods. Similarly, those items which continued to be shipped via this route were generally dominated by low valued commodities such as unprocessed ores and other bulk cargoes (U.S.A.C.E. 1922:1544). As early as 1912, it had been further recognized that the better facilities offered by the new interurban electric lines servicing Grand Haven, Holland and Muskegon had a dramatic impact in diverting cargoes to and from Chicago away from he lake trade (U.S.A.c.E. 1912:1150).

The destructive forces of the current and iceflows threatened the integrity of the structures. In order to secure the structures and maintain the channel several repairs and modifications were made to the structures during the opening of the twentieth century. The extension of the revetments was completed, concrete reinforcement was added, along with steel sheet piling and riprap, and several segments were secured with anchors (Figures 2-5). While these improvements structurally secured the harbor and reduced the amount of shoaling into the channel, constant dredging was required to maintain a depth sufficient for navigation with the depth of the channel (at the end of the piers) being gradually increased from 20 ft in 1913 (U.S.A.C.E. 1913:1147) to its current depth of 24 ft. The channel of the Grand River was also dredged during the first and second decades of the twentieth century to provide a navigable depth for vessels moving between the harbor and upriver dock facilities (U.S.A.C.E. 1913:1149).

The Grand Haven Harbor entrance piers and revetments derive their significance in that they reflect the evolution of an aspect of engineering technology employed in Great Lakes federal and private harbor projects during the mid-nineteenth through early twentieth centuries. This period was in one sense marked by the carry over of traditional pre-industrial pier components such as exemplified in the continued utilization of stone filled timber crib substructures, which dominated facility construction activities during the 1867 through 1894 period.

Regional industrialization allowed for certain technological innovations to be adapted to pier construction by the closing decade of the nineteenth century. The development of local Portland cement production utilizing iron and steel furnace slags led to the use of massed and slab concrete superstructure designs at the Grand Haven facility by 1916.

The transition to the use of driven steel sheet piling for pier construction and reconstruction projects can be documented for COE harbor improvement activities in the Great Lakes to a ca. 1934 setting. Its appearance at Grand Haven Harbor, began in 1951. The resultant steel sheet substructures (7,022 ft) set in place over the 32-year period between 1951 and 1983 have obscured approximately 80 percent of the original pier and revetment components (Figures 1 through 5). These, however, have not been destroyed, but, merely sealed with an exterior facade containing the old piers and revetments as a core element and forming what might best be referred to as a stratified composite structure.

Original substructure construction design elements potentially open to visual examination form approximately 20 percent (1,720 ft) of the 8,742 ft long pier and revetment structures. This unaltered element is restricted to Sections D and G of the north revetment (456 ft) and Section P of the south revetment (1,164 ft).

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Verbal Boundary Description

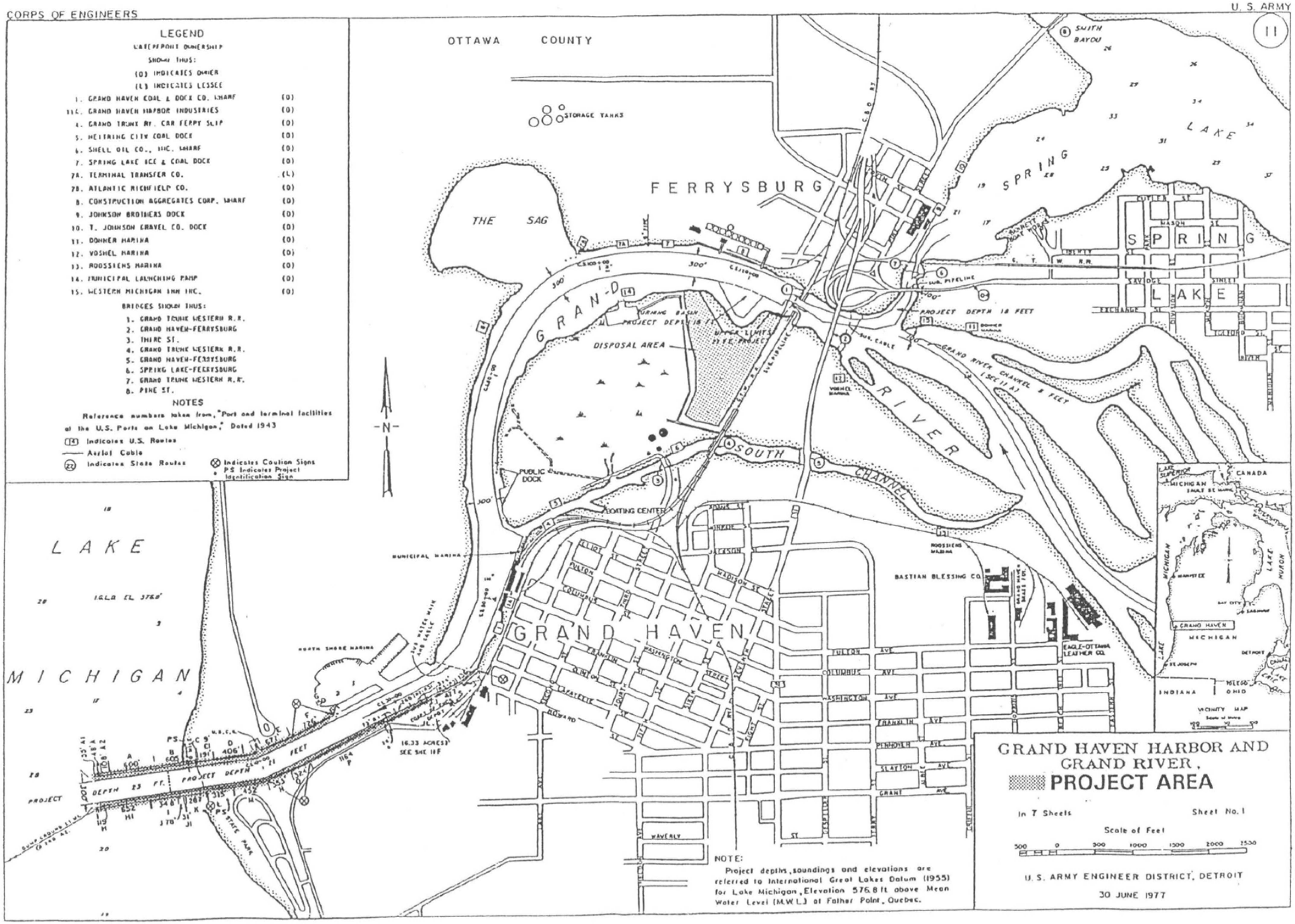
The nominated navigation structures at Grand Haven Harbor, Michigan, consist of COE-owned and maintained properties designated as the north pier (1,414 ft), the south pier (1,495 ft), the north revetment (2,159 ft), and the south revetment (3,674 ft). The combined structures (nominated) extend for a total distance of 8,742 lineal ft and encompass an area of approximately 279,744 sq ft (6.42 acres); calculated at an overall average of 32 ft width.

Boundary Justification

The nominated property is restricted to those structural elements under actual COE ownership and jurisdiction flanking the ship channel entrance at the mouth of the Grand River in the City of Grand Haven, Ottawa County, Michigan. The nominated property does not include the channel or lake bottoms abutting the piers and revetments.

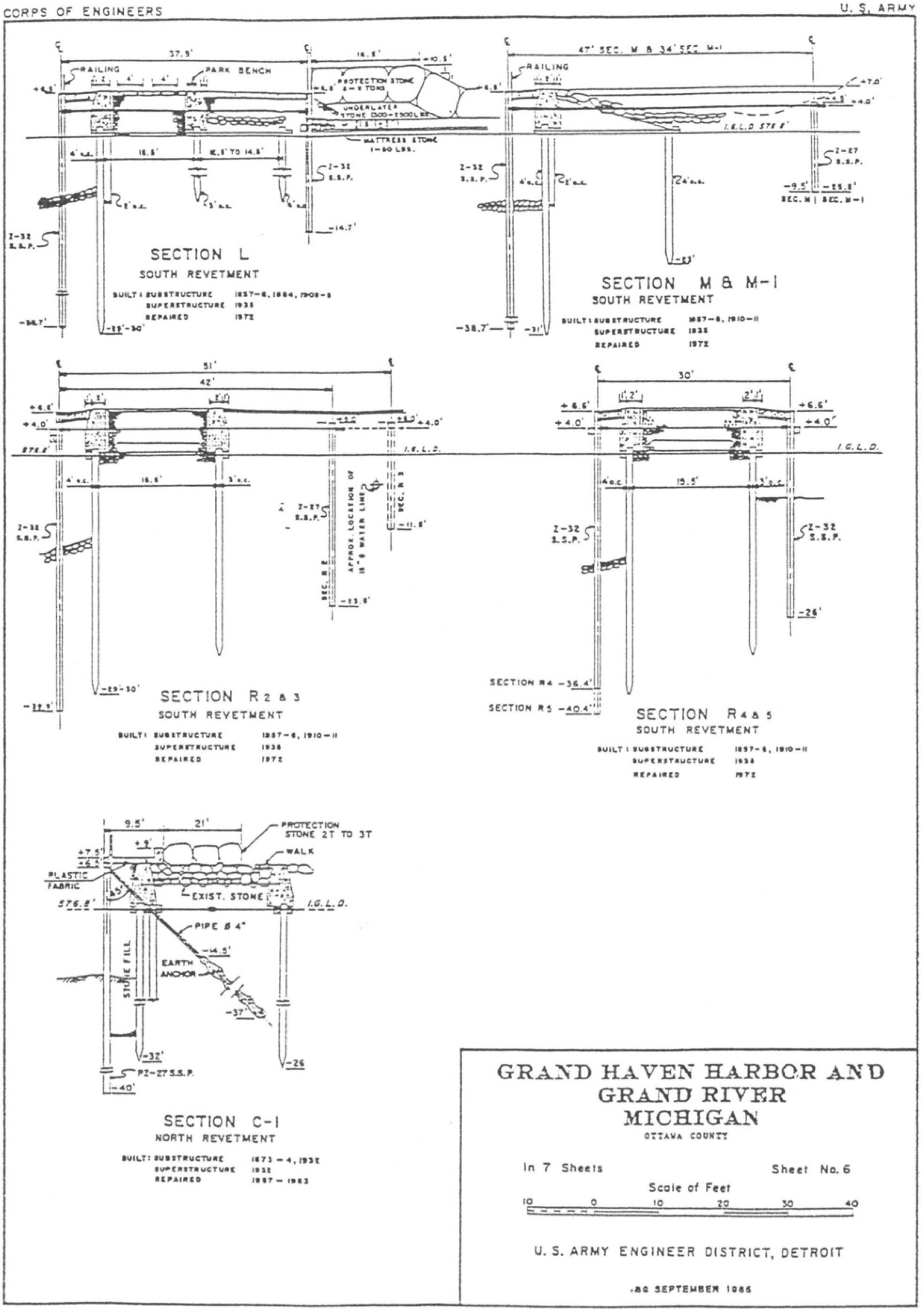
Photographs

1.	Photographer:	Christopher J. Marzonie
	Date:	31 May 1993
	Negative Location:	Commonwealth Cultural Resources Group, Inc., Jackson, MI
	Description:	South Pier, Grand Haven Harbor. View to Northwest
2.	Photographer:	Christopher J. Marzonie
	Date:	31 May 1993
	Negative Location:	Commonwealth Cultural Resources Group, Inc., Jackson, MI
	Description:	North Pier, Grand Haven Harbor. View to North
3.	Photographer:	Christopher J. Marzonie
	Date:	31 May 1993
	Negative Location:	Commonwealth Cultural Resources Group, Inc., Jackson, MI
	Description:	North Pier, Grand Haven Harbor. View to North-Northwest



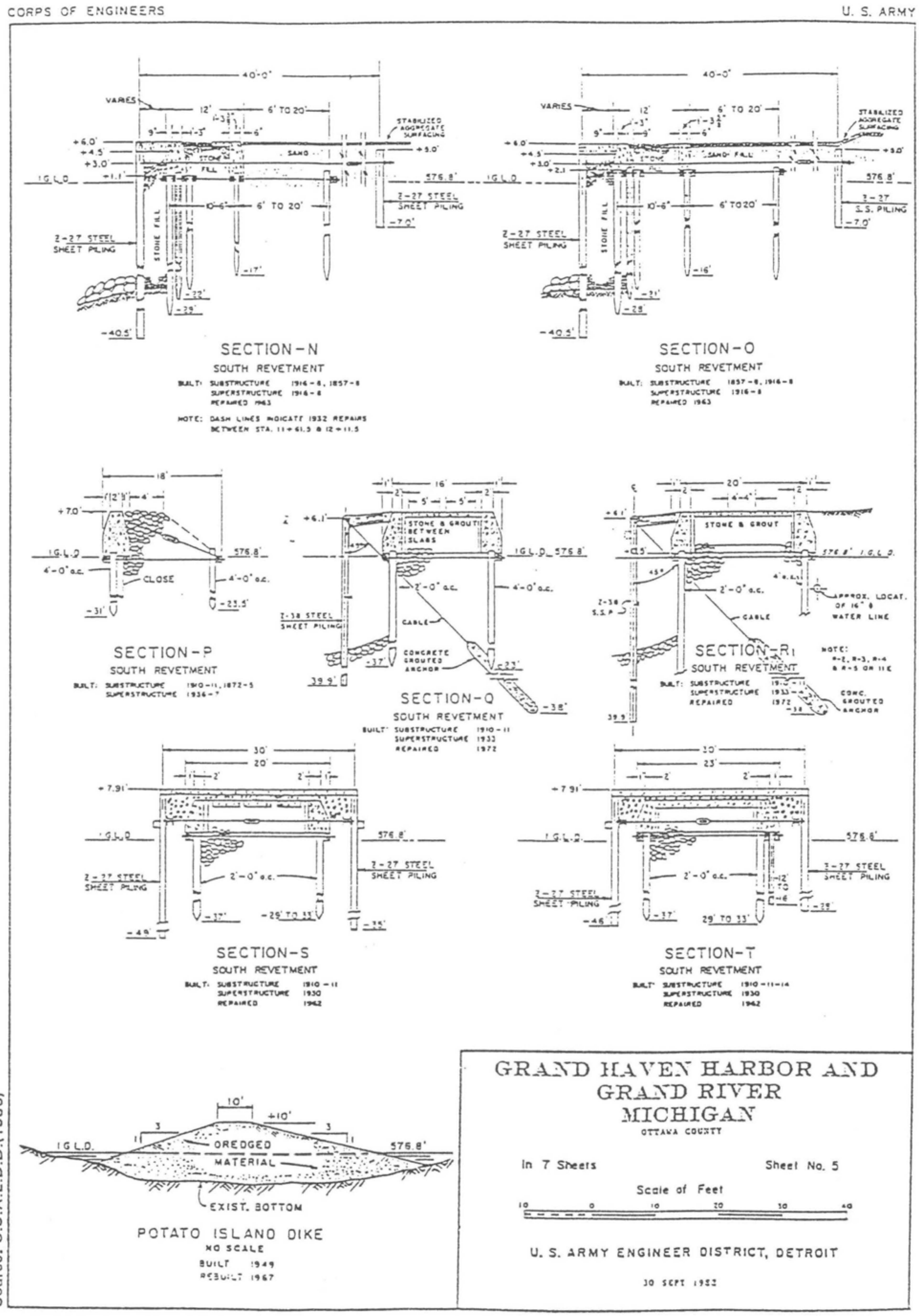
Source: U.S.A.E.D.D. (1986)

Figure 1. Grand Haven Harbor Piers and Revetments



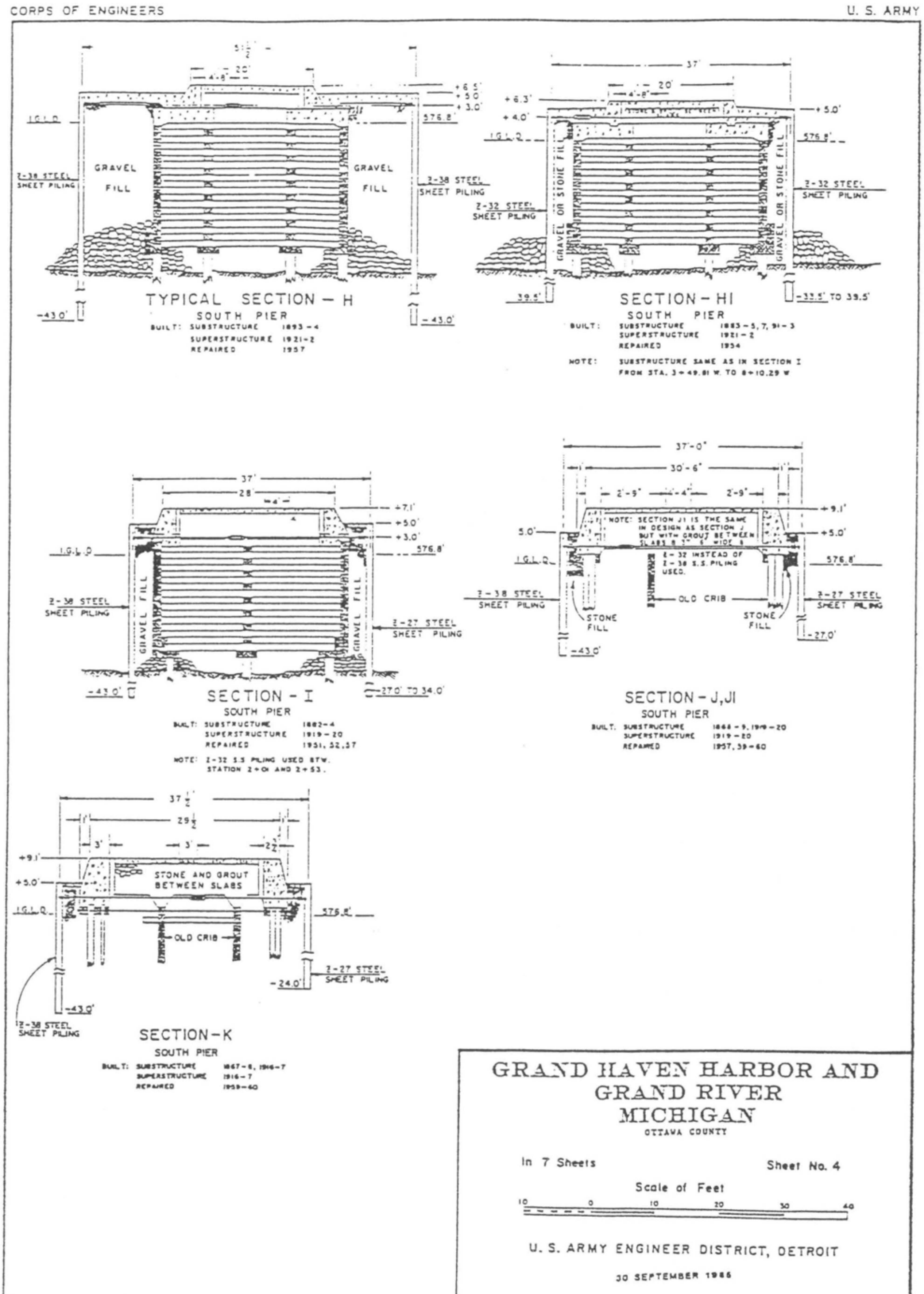
Source: U.S.A.E.D.D.(1986)

Figure 2. Segment Cross Sections South and North Revetments



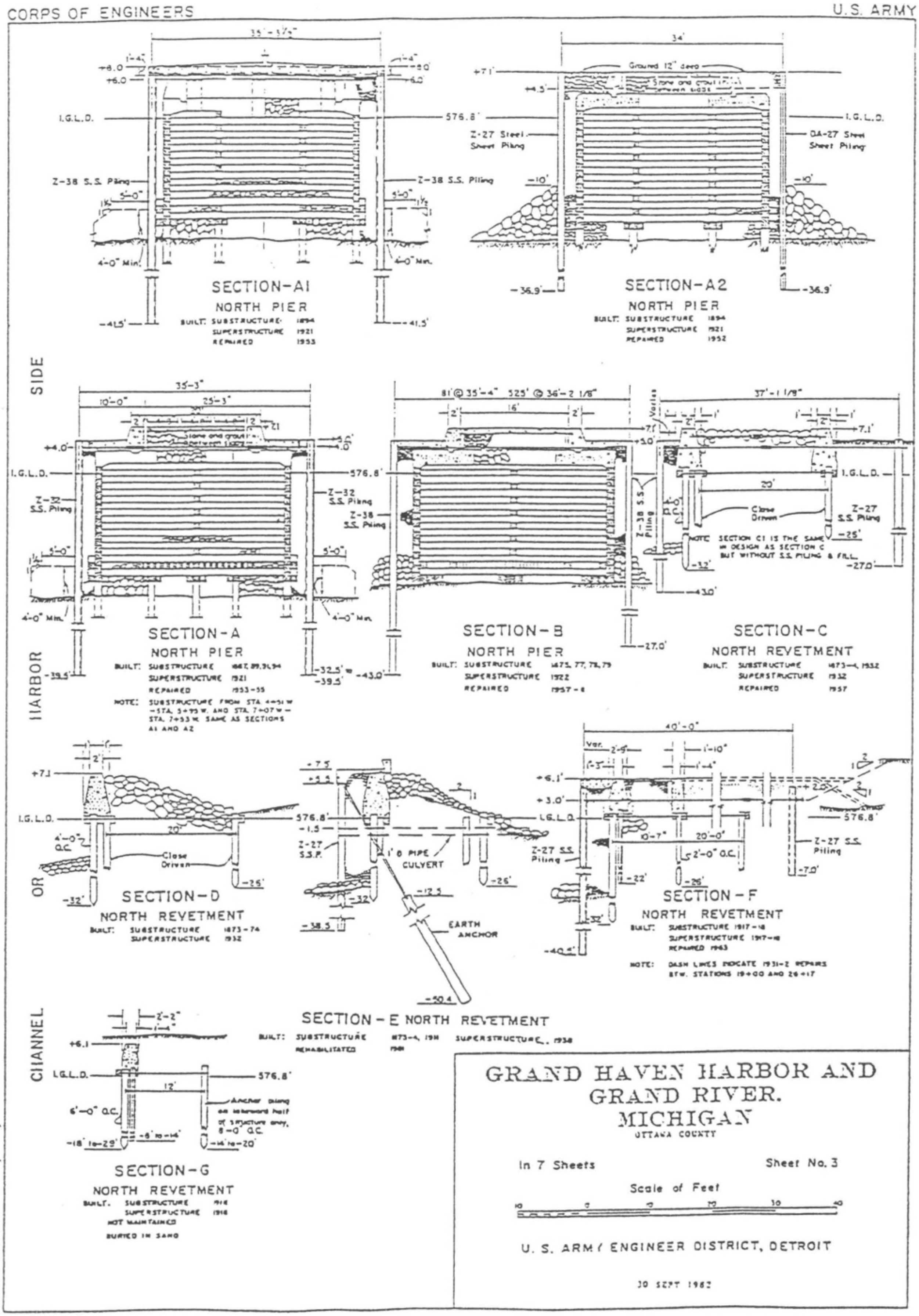
Source: U.S.A.E.D.D.(1986)

Figure 3. Segment Cross Sections South Revetment



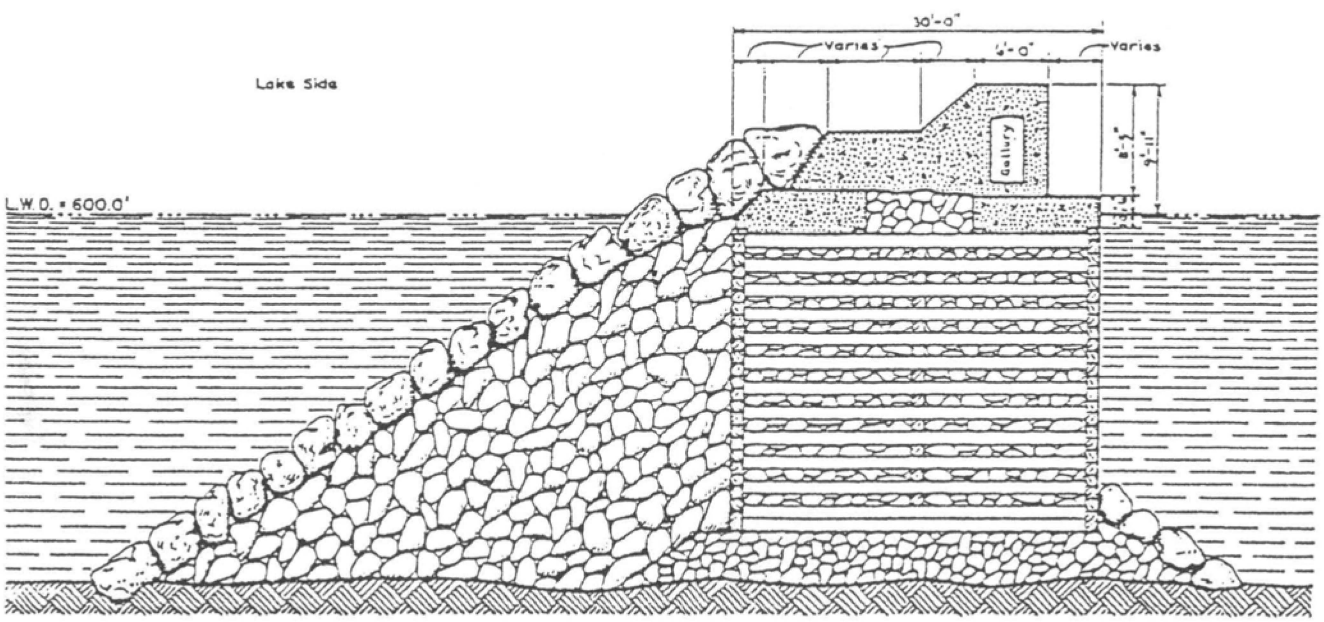
Source: U.S.A.E.D.D.(1986)

Figure 4. Segment Cross Sections South Pier



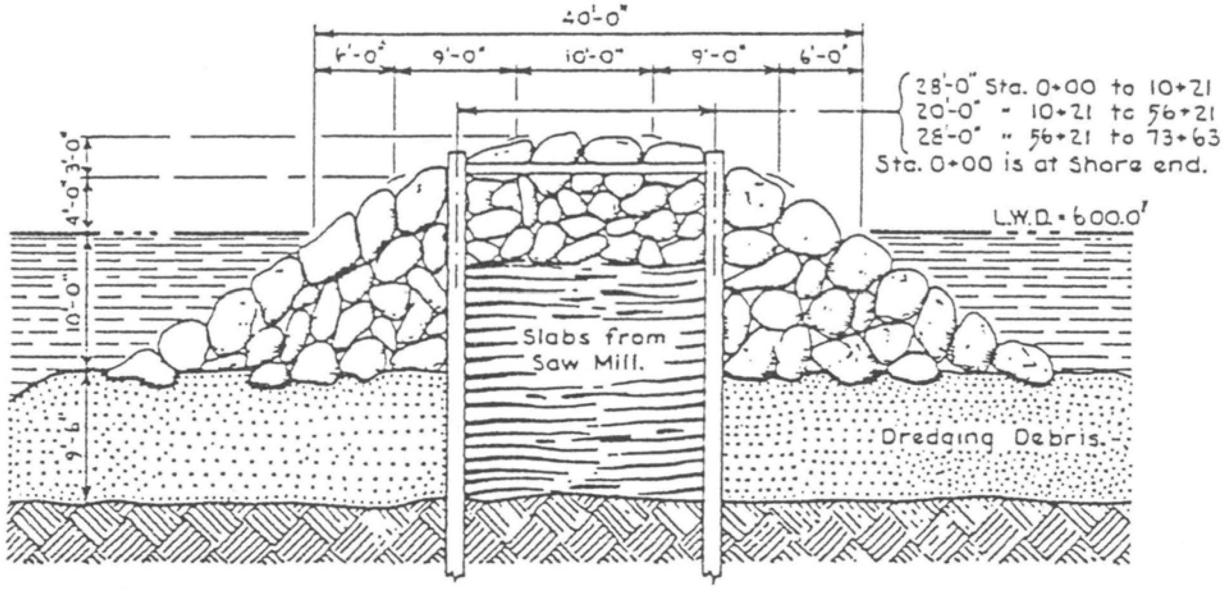
Source: U.S.A.E.D.D. (1986)

Figure 5. Segment Cross Section North Pier and Revetments



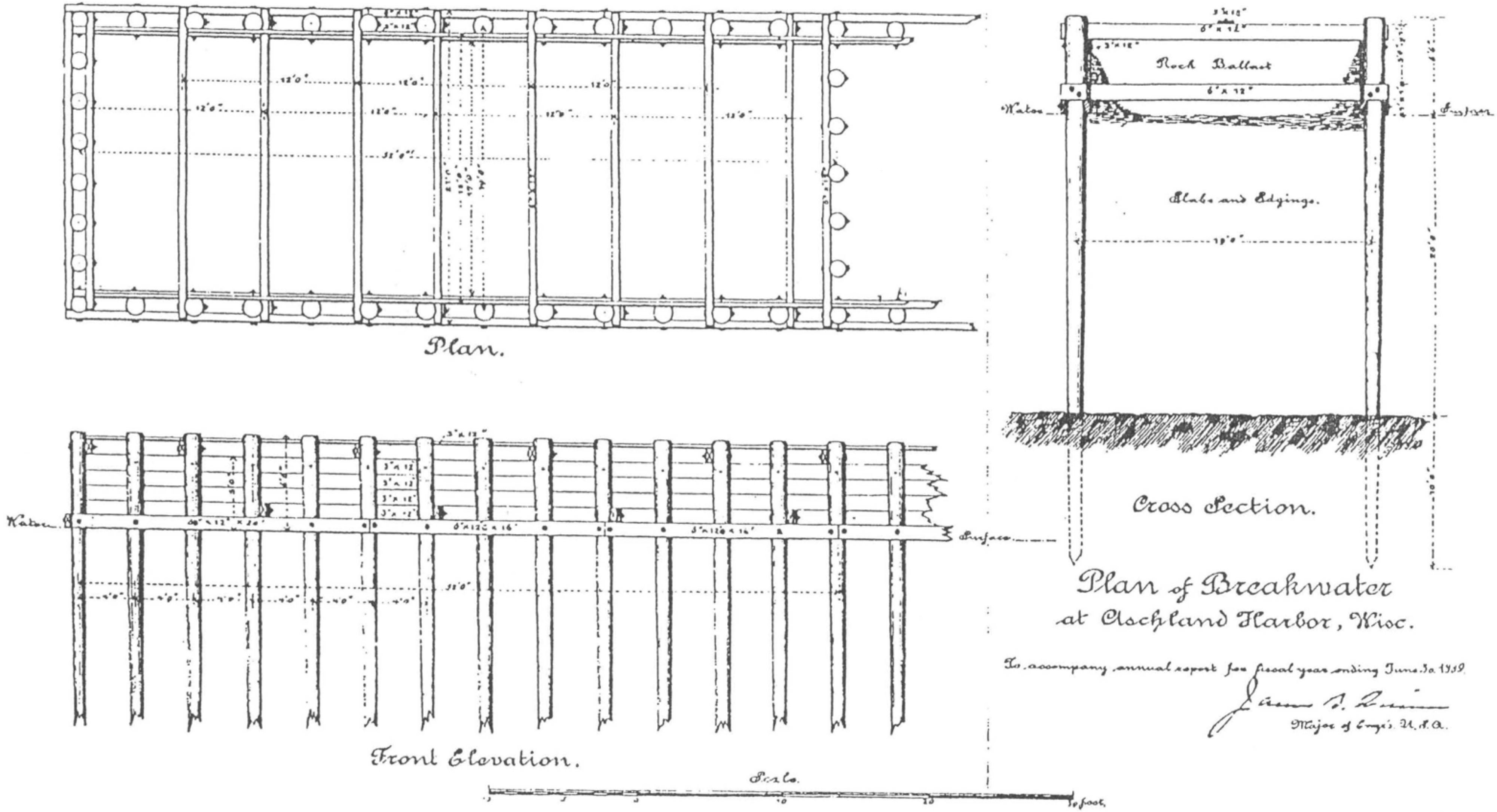
Source: U.S.A.E.D.D.(1986)

Figure 6. Marquette Harbor Breakwater



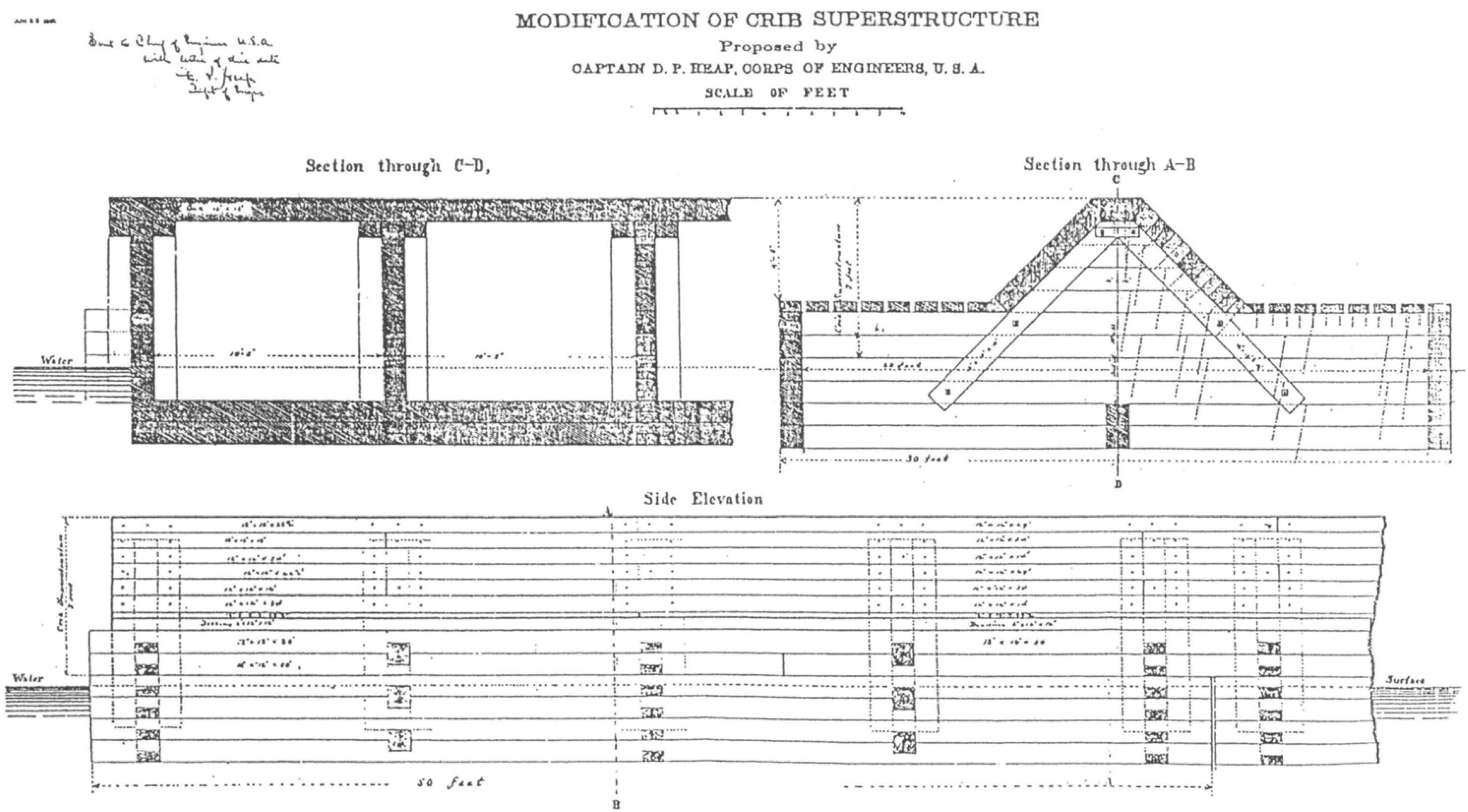
Source: U.S.A.E.D.D. (1986)

Figure 7. Ashland Harbor Breakwater



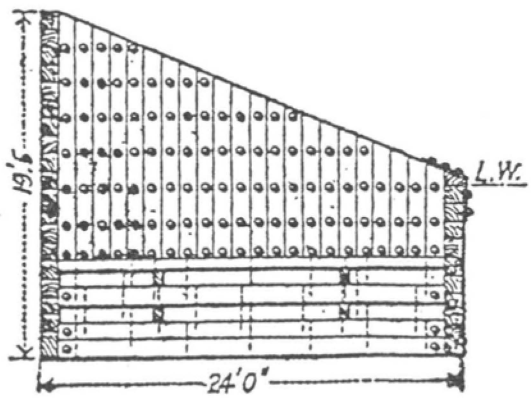
Source: U.S.A.C.E (1889)

Figure 8. Slab Breakwater, Ashland Harbor

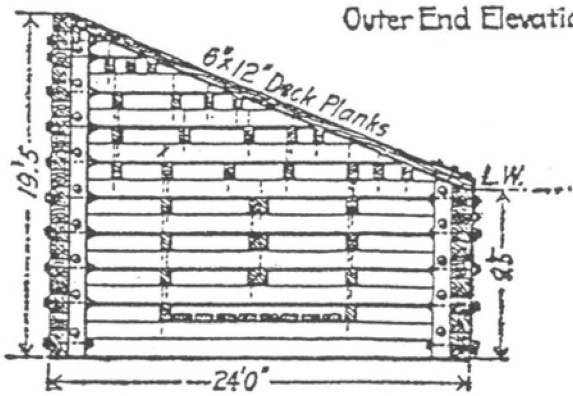


Source: U.S.A.C.E. (1883)

Figure 9. Breakwater Superstructure, Frankfort Harbor



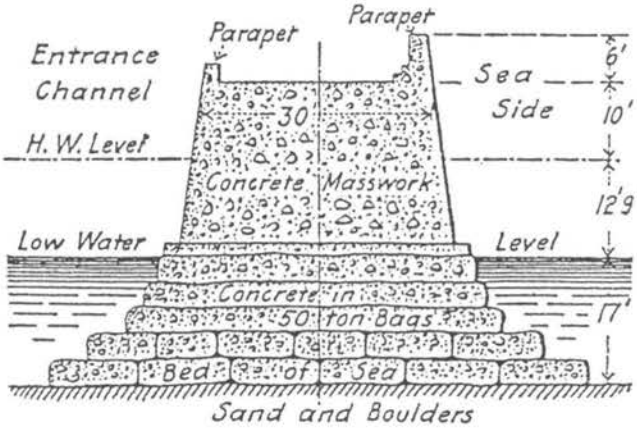
Outer End Elevation.



Cross Section

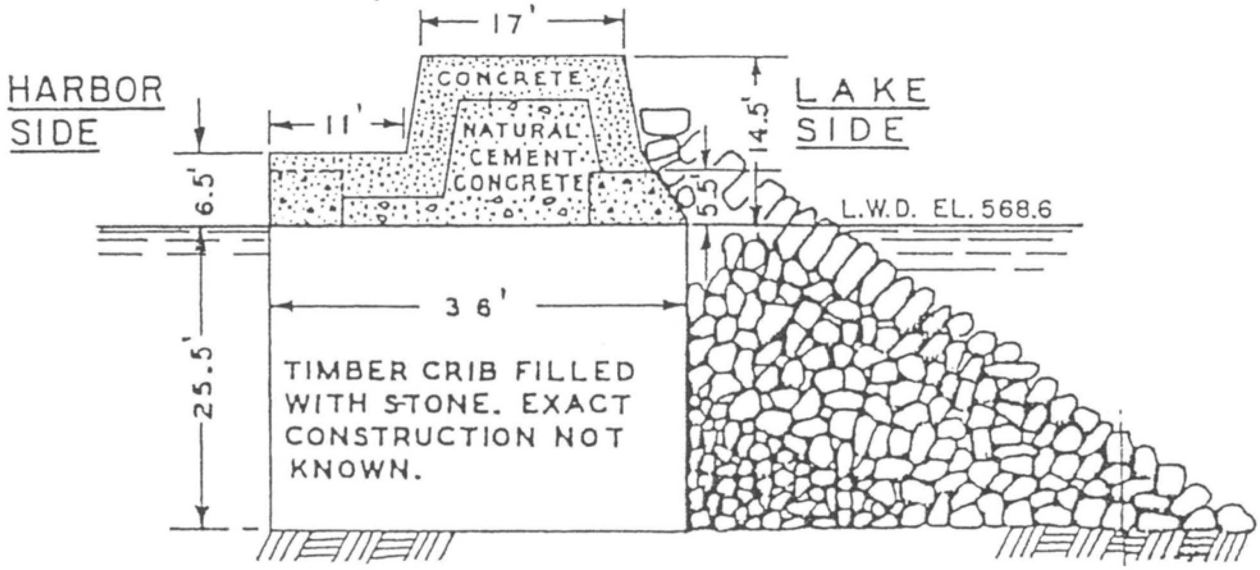
Source: Wright (1914:701)

Figure 10. Presque Isle Harbor Breakwater



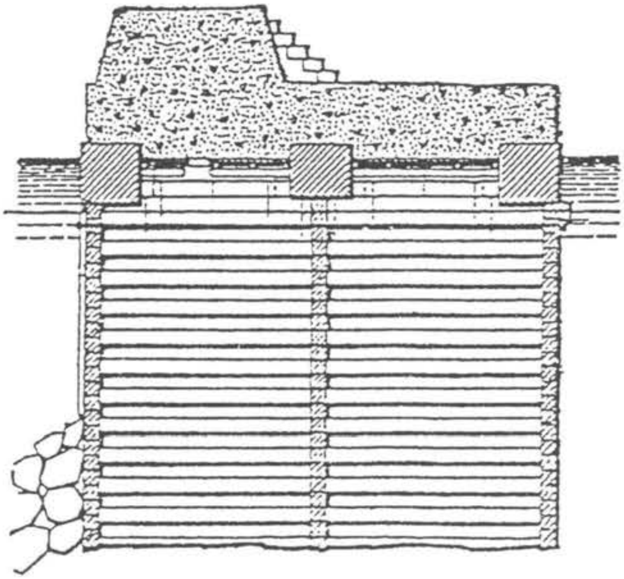
Source: Wright (1914:702)

Figure 11. Aberdeen Harbor Breakwater



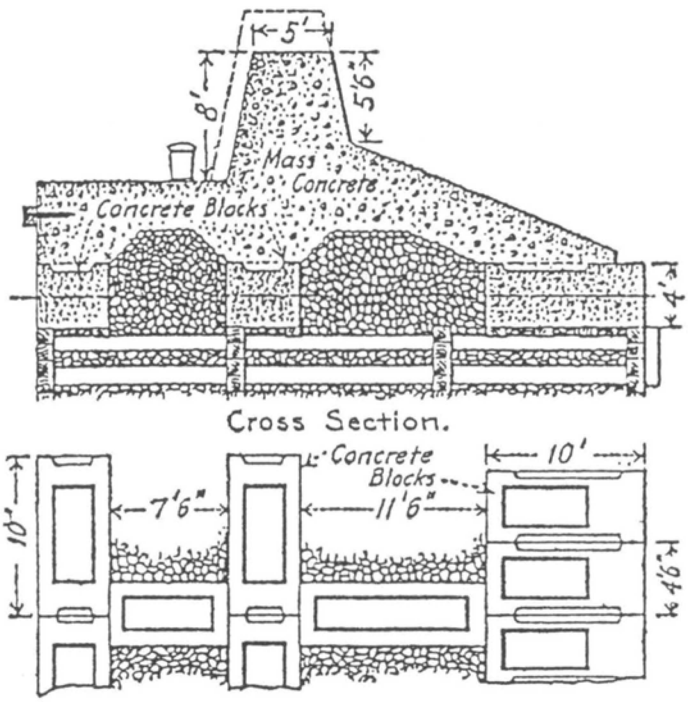
Source: U.S.A.E.D.B. (1983)

Figure 12. Buffalo Harbor "Old Breakwater"



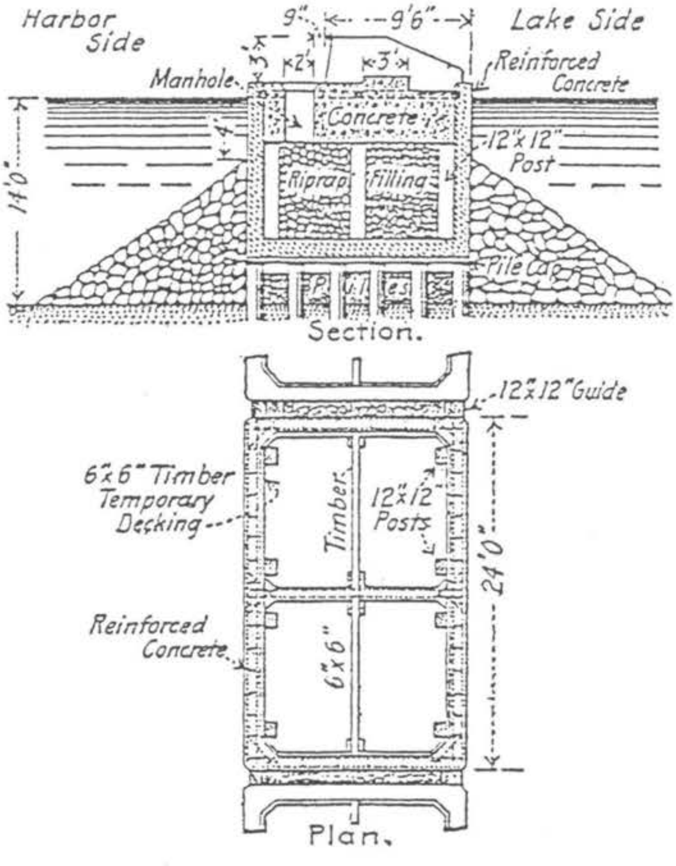
Source: Wright (1914:701)

Figure 13. Cleveland West Harbor Breakwater



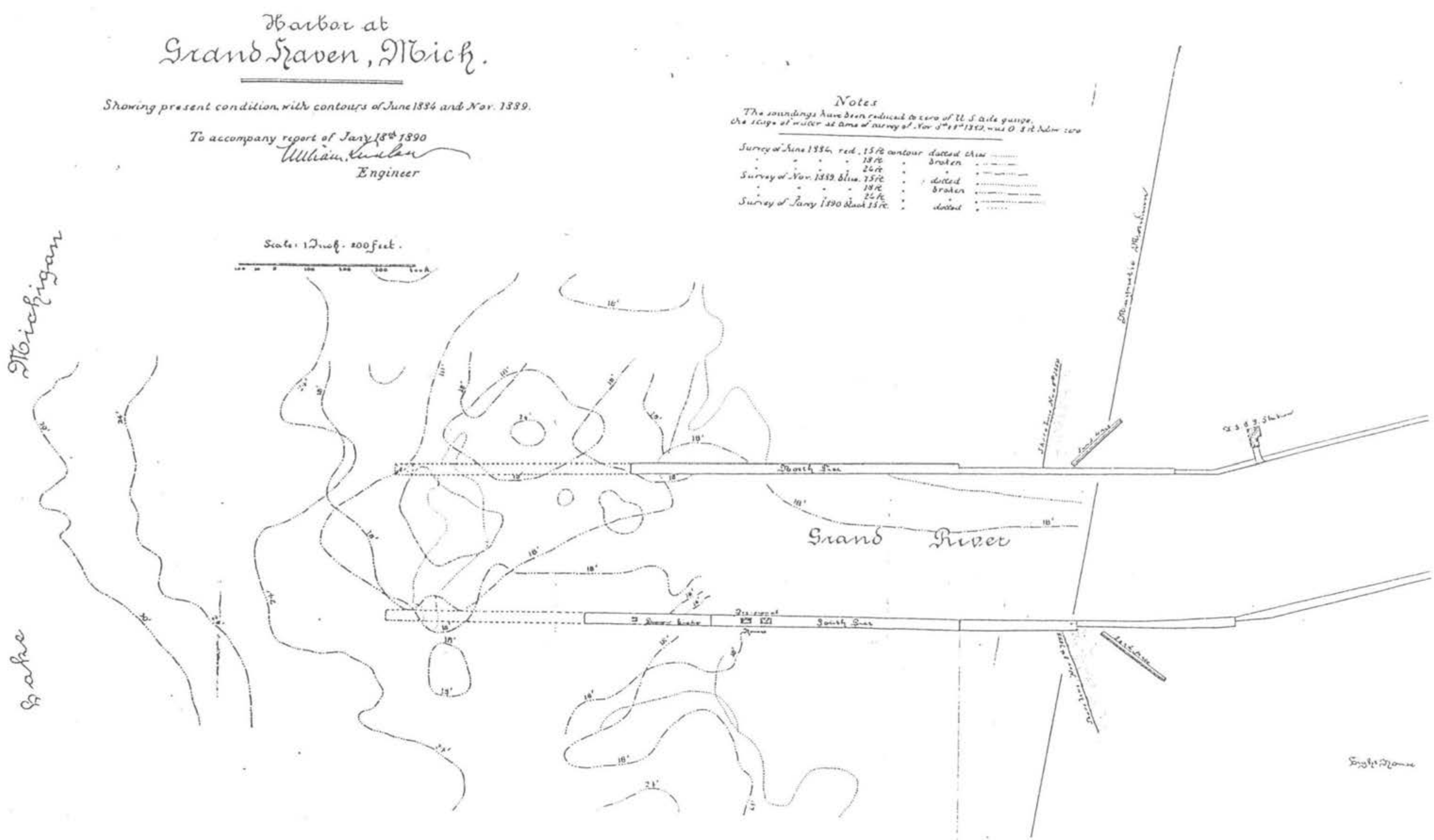
Source: Wright (1914:702)

Figure 14. Harbor Beach Breakwater Superstructure



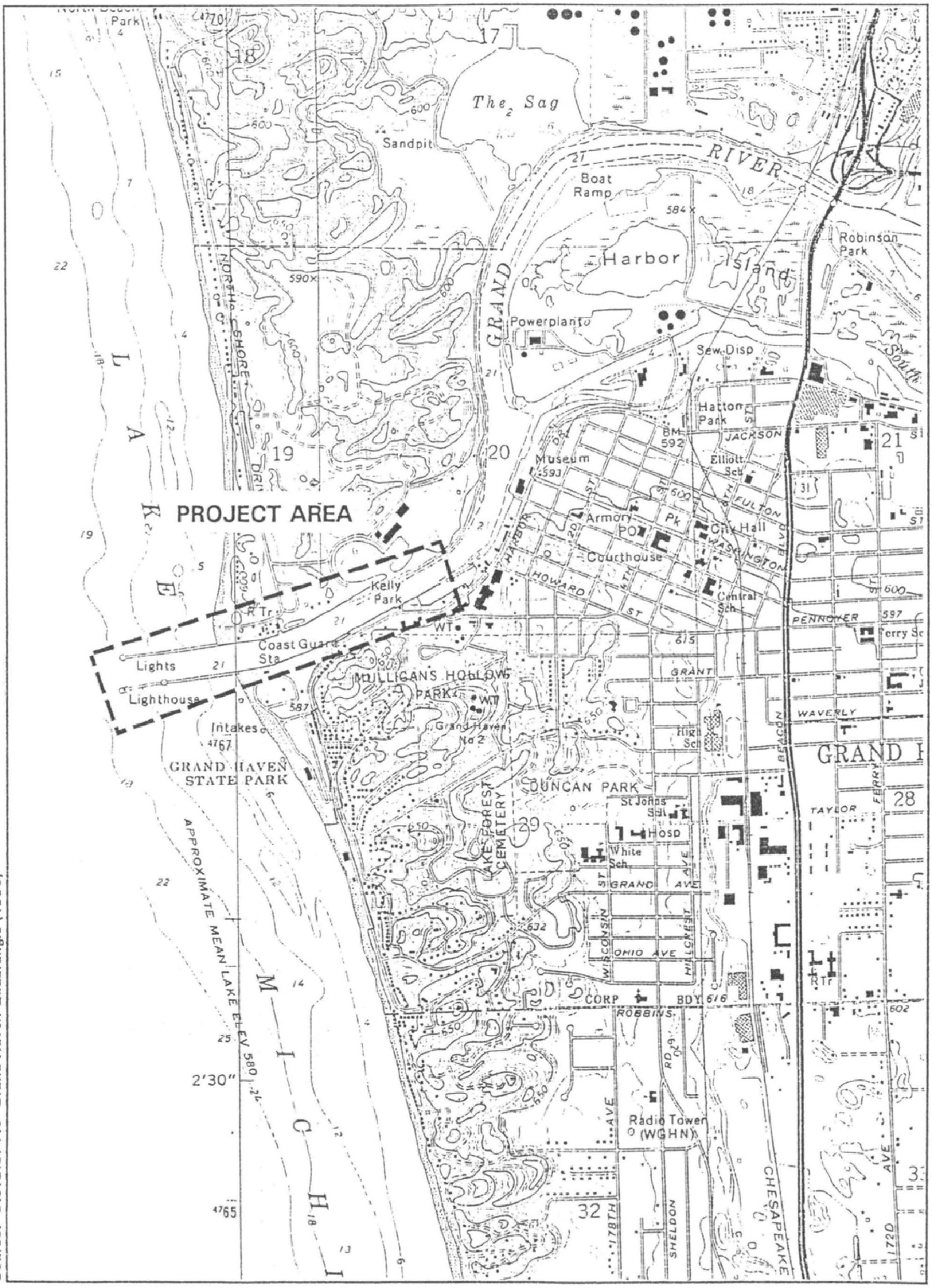
Source: Wright (1914:703)

Figure 15. Algoma Harbor Breakwater

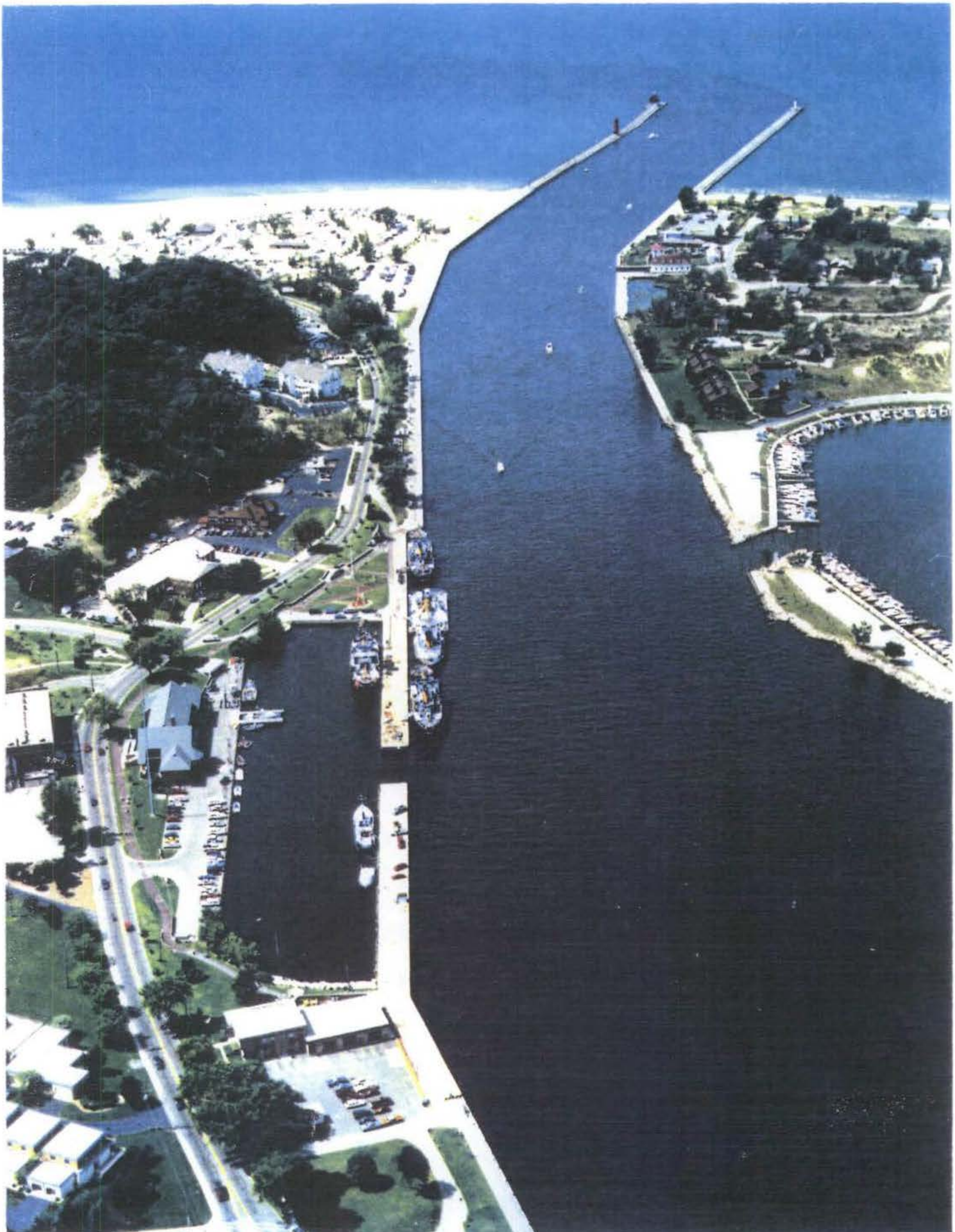


Source: U.S.A.C.E. (1890)

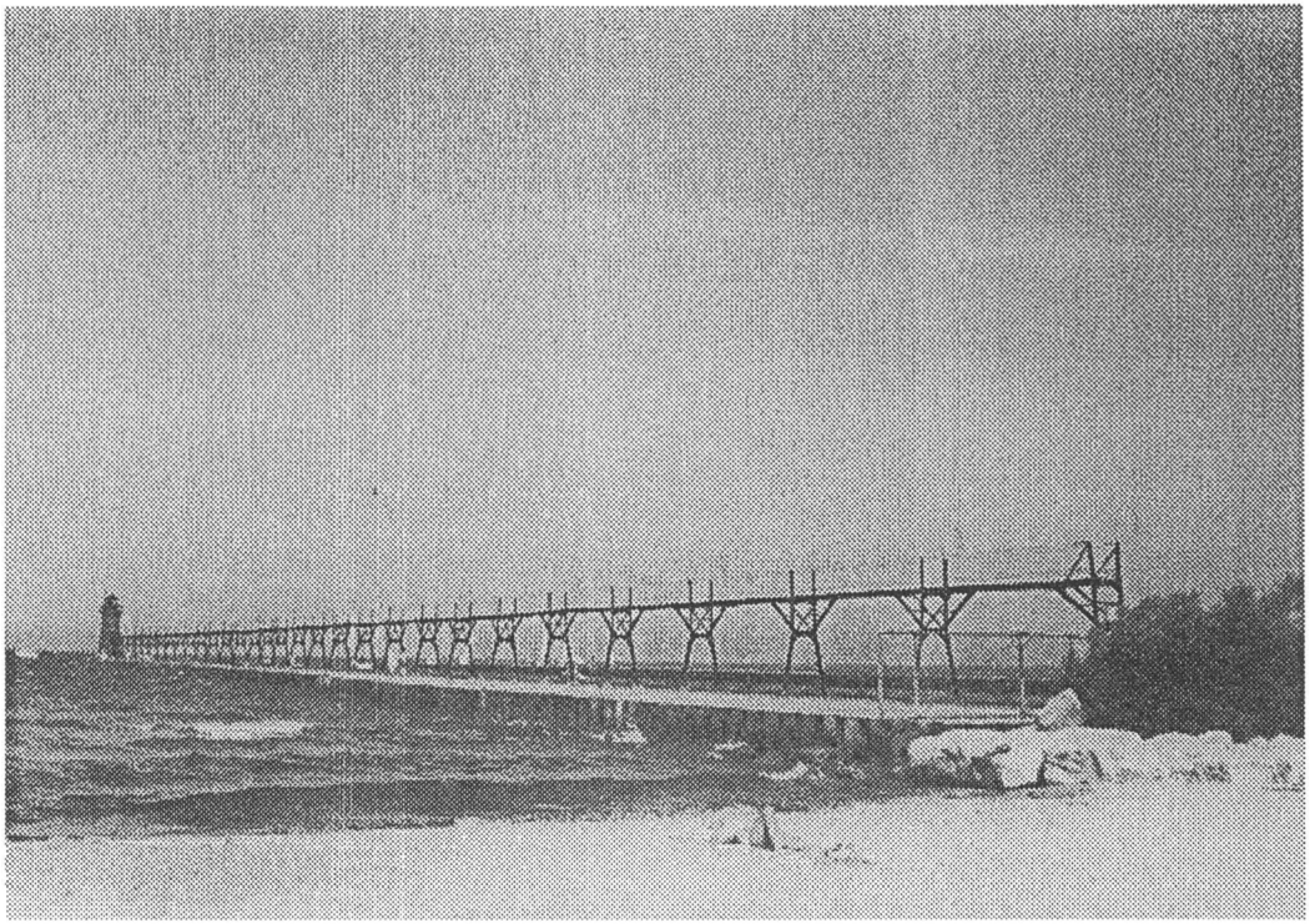
Figure 16. Grand Haven Navigation Works, 1890



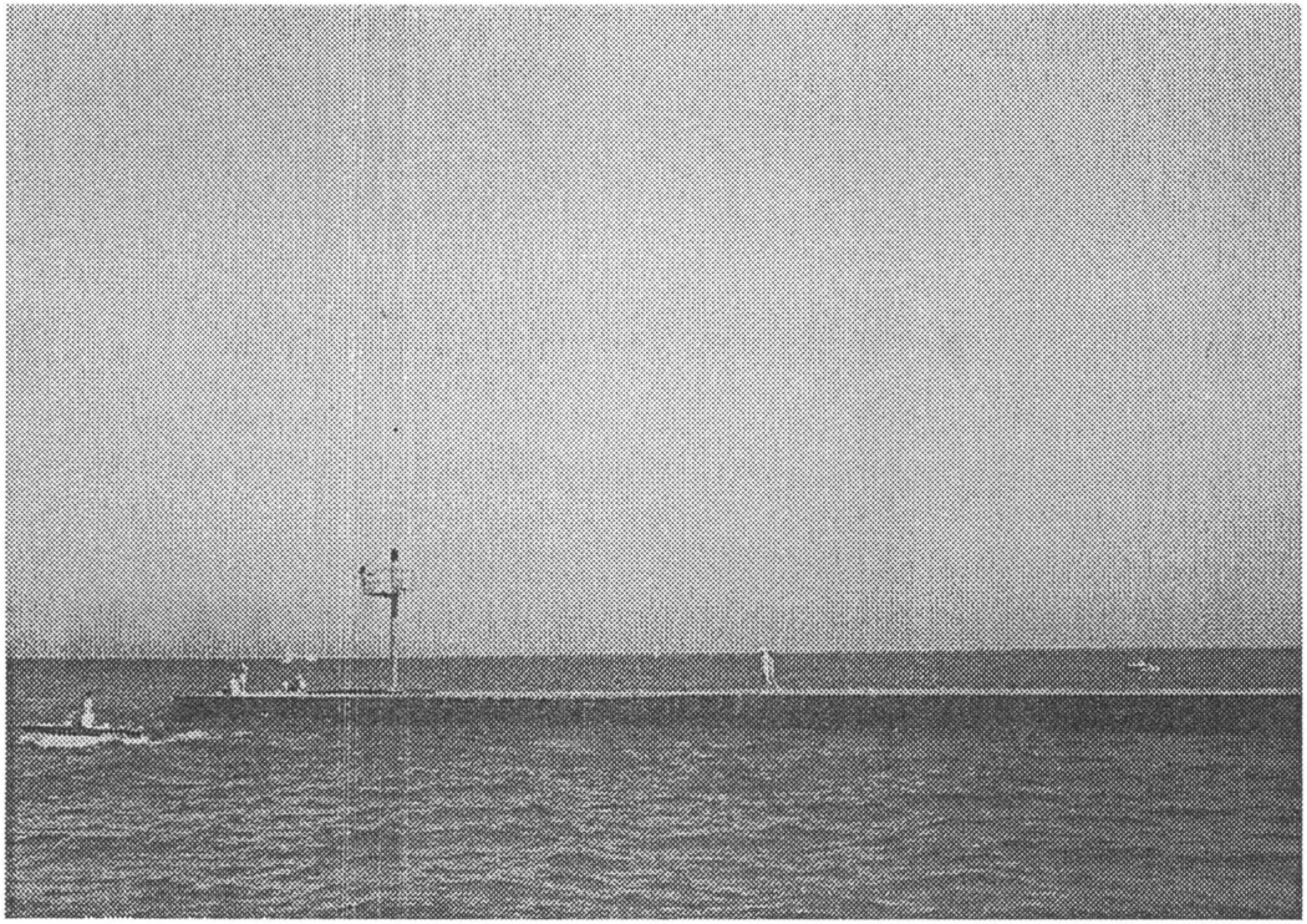
Source: U.S.G.S. 7.5' Grand Haven Quadrangle (1980)



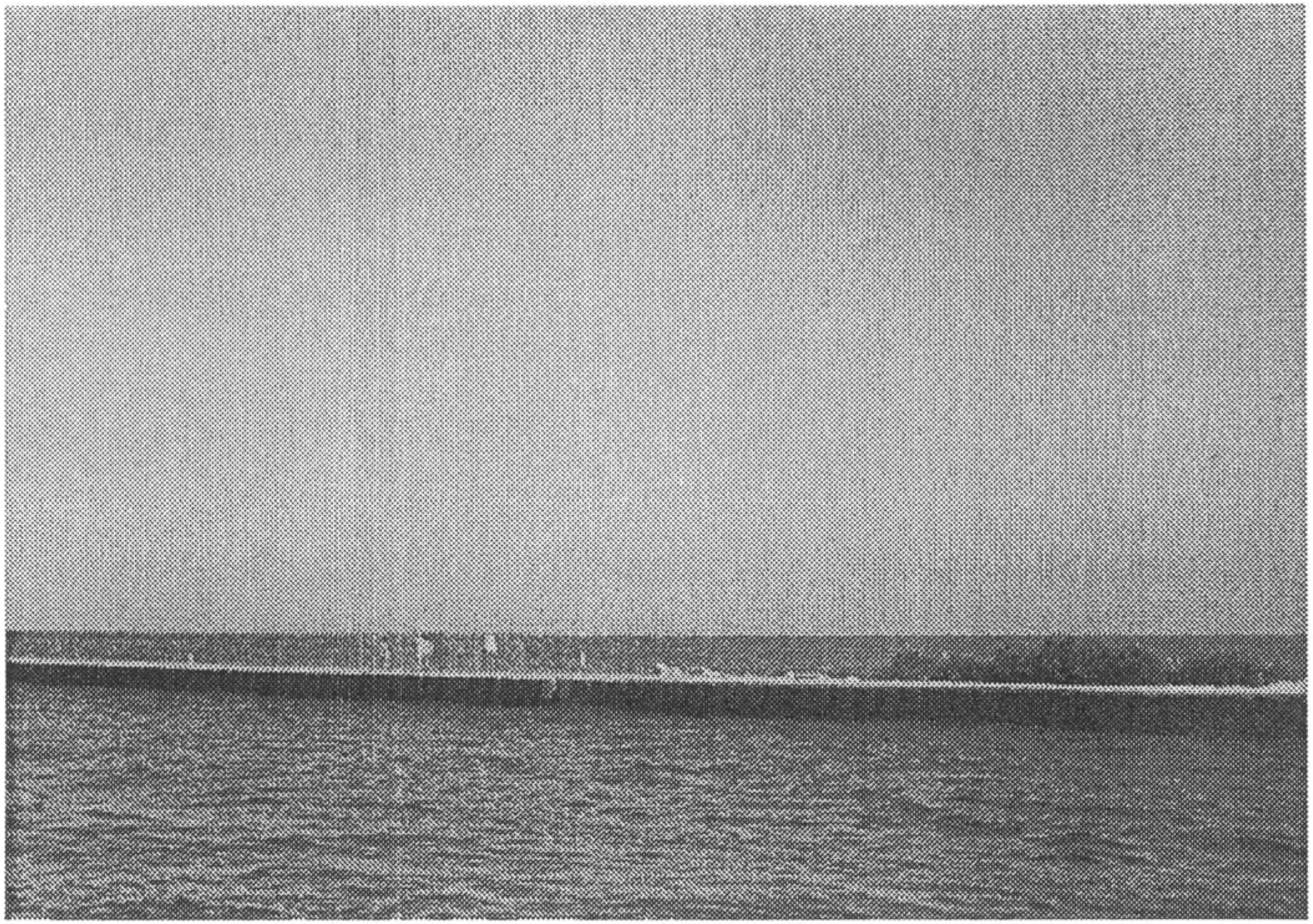
Grand Haven Harbor Pier and Revetment



1. South Pier, Grand Haven, Ottawa County, Michigan

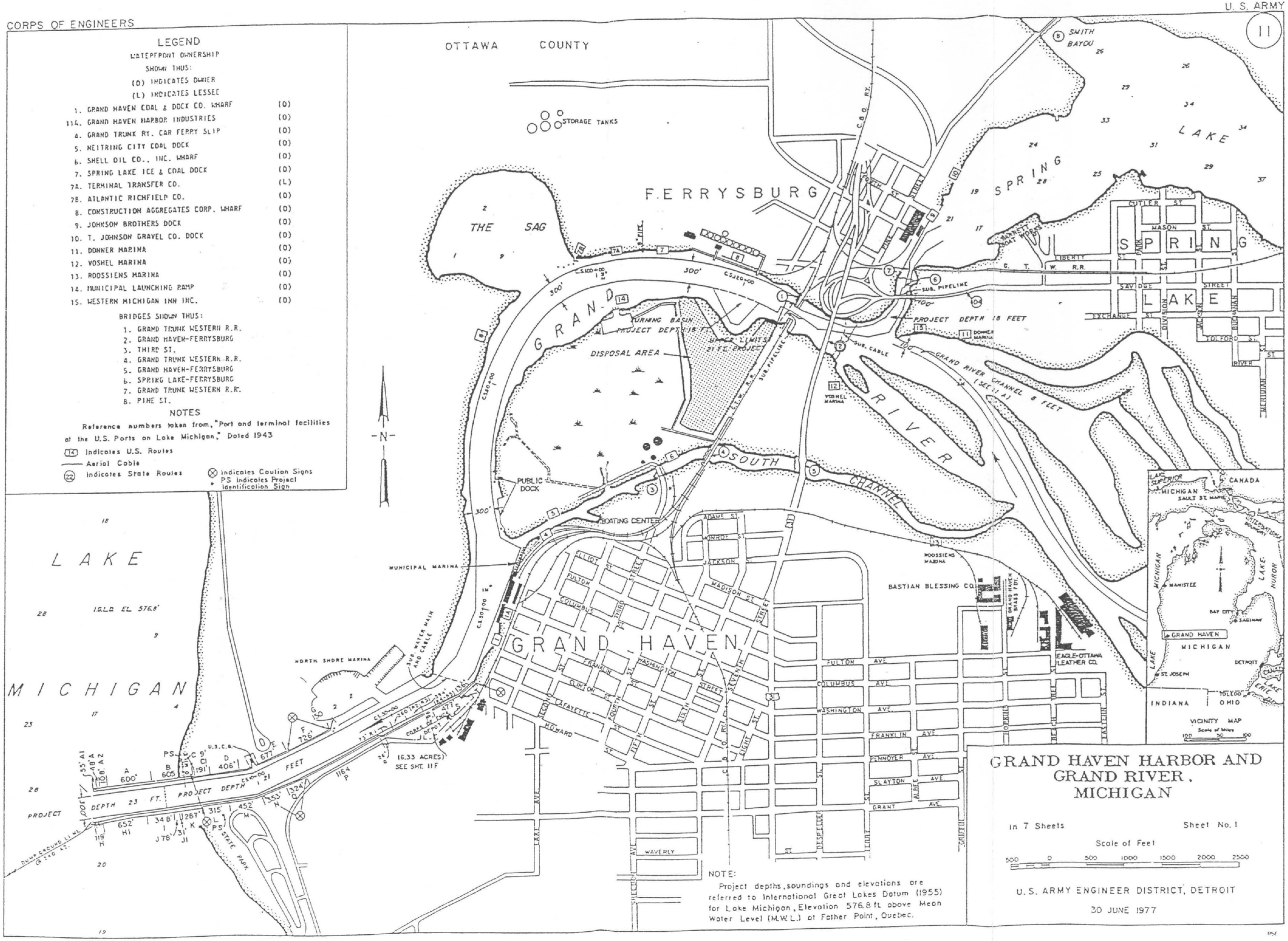


2. *North Pier, Grand Haven, Ottawa County, Michigan*



3. North Pier, Grand Haven, Ottawa County, Michigan

U. S. ARMY
CORPS OF ENGINEERS



ITEM 1
SOUTH PIER, GRAND HAVEN
OTTAWA Co., MI

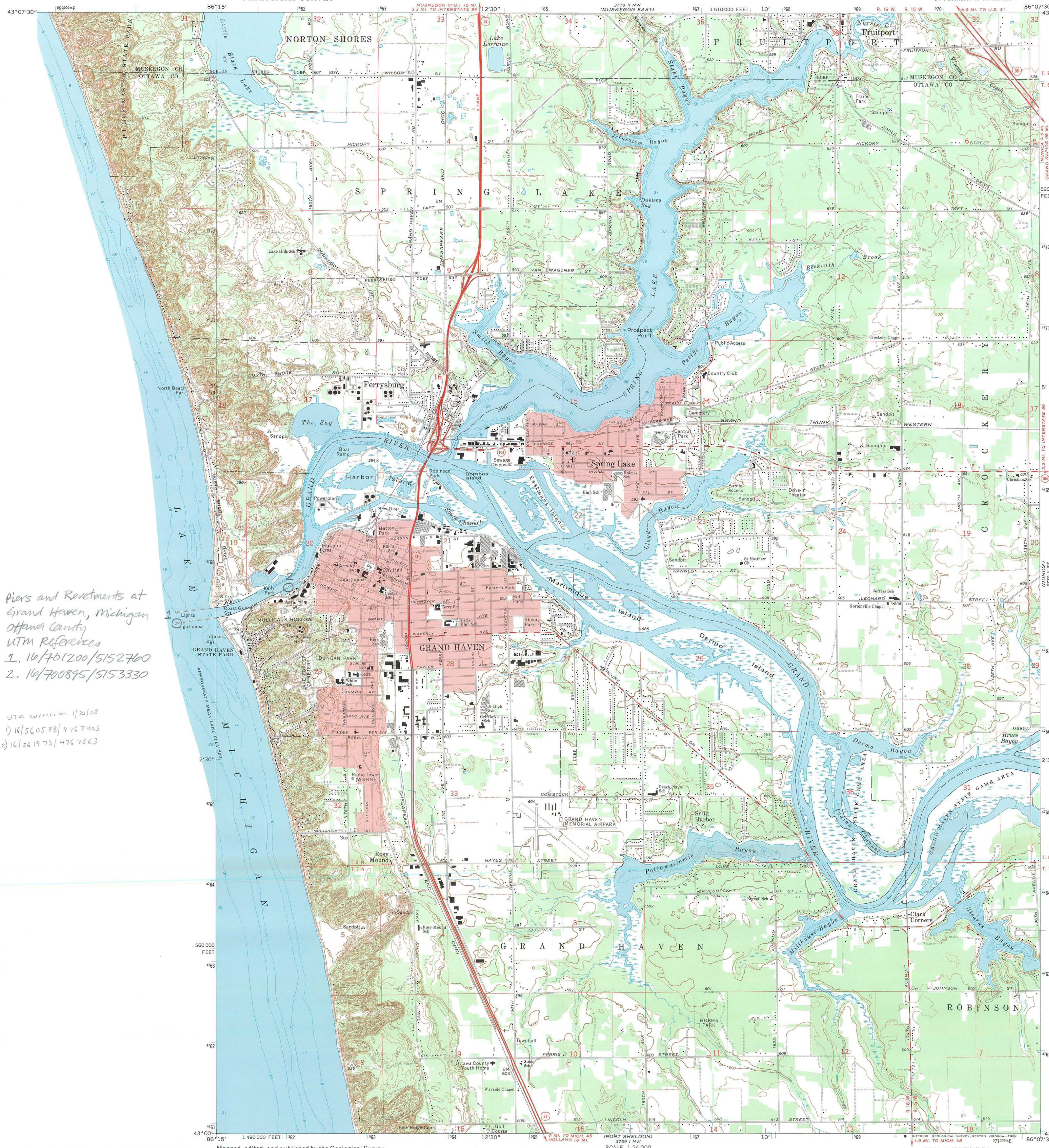
ITEM 2
NORTH PIER, GRAND HAVEN
OTTAWA Co., Mi

ITEM 3
NORTH PIER, GRAN HAVEN
OTTAWA Co., Mi

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF MICHIGAN

GRAND HAVEN QUADRANGLE
MICHIGAN
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 MUSKEGON 15' QUADRANGLE



Piers and Revetments at
Grand Haven, Michigan
Ottawa County
UTM References
1. 16/701200/5152760
2. 16/700895/5153330

UTM correction 1/30/08
1) 16/560588/4767405
2) 16/561973/4767863

Mapped, edited, and published by the Geological Survey
in cooperation with State of Michigan agencies

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1969. Field checked 1972

Selected hydrographic data compiled from U. S. Lake Survey Charts 76 (1973) and 765 (1972). This information is not intended for navigational purposes

Projection and 10,000-foot grid ticks: Michigan coordinate system, south zone (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid ticks, zone 16, shown in blue. 1927 North American datum

Red tint indicates areas in which only landmark buildings are shown

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

Map photoinspected 1980
No major culture or drainage changes observed

UTM GRID AND 1972 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS LOW WATER 576.8 FEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
AND GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF NATURAL RESOURCES, LANSING, MICHIGAN 48909
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

MICHIGAN
QUADRANGLE LOCATION

To place on the predicted North American Datum 1983 move the projection lines 2 meters north and 2 meters east as shown by dashed corner ticks

ROAD CLASSIFICATION

Primary highway, hard surface
Light-duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

GRAND HAVEN, MICH.
SW/4 MUSKEGON 15' QUADRANGLE
43086-A2-TF-024

1972
PHOTOINSPECTED 1980
DMA 3770 II SW—SERIES V862

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
EVALUATION/RETURN SHEET

REQUESTED ACTION: NOMINATION

PROPERTY NAME: Piers and Revetments at Grand Haven, Michigan

MULTIPLE NAME:

STATE & COUNTY: MICHIGAN, Ottawa

DATE RECEIVED: 9/08/95 DATE OF PENDING LIST: 9/19/95
DATE OF 16TH DAY: 10/05/95 DATE OF 45TH DAY: 10/23/95
DATE OF WEEKLY LIST:

REFERENCE NUMBER: 95001161

NOMINATOR: FEDERAL

REASONS FOR REVIEW:

APPEAL:	N	DATA PROBLEM:	N	LANDSCAPE:	N	LESS THAN 50 YEARS:	N
OTHER:	N	PDIL:	N	PERIOD:	N	PROGRAM UNAPPROVED:	N
REQUEST:	N	SAMPLE:	N	SLR DRAFT:	N	NATIONAL:	N

COMMENT WAIVER: N

√ ACCEPT ___RETURN ___REJECT 10/23/95 DATE

ABSTRACT/SUMMARY COMMENTS:

RECOM./CRITERIA ________________

REVIEWER ________________ DISCIPLINE ________________

TELEPHONE ________________ DATE ________________

DOCUMENTATION see attached comments Y/N see attached SLR Y/N

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

7 SEP 1995

Policy Review and Analysis Division
Office of Environmental Policy

Ms. Carol Shull
Chief of Registration
National Register of Historic Places
Department of the Interior
National Park Service
Post Office Box 37127
Washington, D.C. 20013-7127

Dear Ms. Shull:

Enclosed are four National Register of Historic Places nominations for historic structures in Michigan and Minnesota. The nominations are: Navigation Structures at South Haven Harbor, Van Buren County, Michigan; South Breakwater at Manistee Harbor, Manistee County, Michigan; Piers and Revetments at Grand Haven, Ottawa County, Michigan; and U.S. Army Corps of Engineers Vessel Yard at Duluth, St. Louis County, Minnesota. These nominations were prepared by the Corps Detroit District in conjunction with the Michigan and Minnesota State Historic Preservation Offices.

As the Corps Federal Preservation Officer, I have reviewed the nominations and have certified by signing Section 3. of the enclosures that the four historic properties should be included in the National Register of Historic Places. I request that you take the actions necessary to list these properties and inform me when the process is complete. Should you find that these submittals require revision or, if additional information is needed, please return the nomination(s) to me with your requirements.

Sincerely,

A. Forester Einarsen

A. Forester Einarsen
Chief, Office of Environmental Policy
Policy Review and Analysis Division

Enclosures

Copies Furnished:
Commander, North Central Division, ATTN: CENCD-PE-PD-ER
Commander, Detroit District, ATTN: CENCE-EP-E