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(U) CORPS OF ENGINEERS BUFFALO NY BUFFALO DISTRICT
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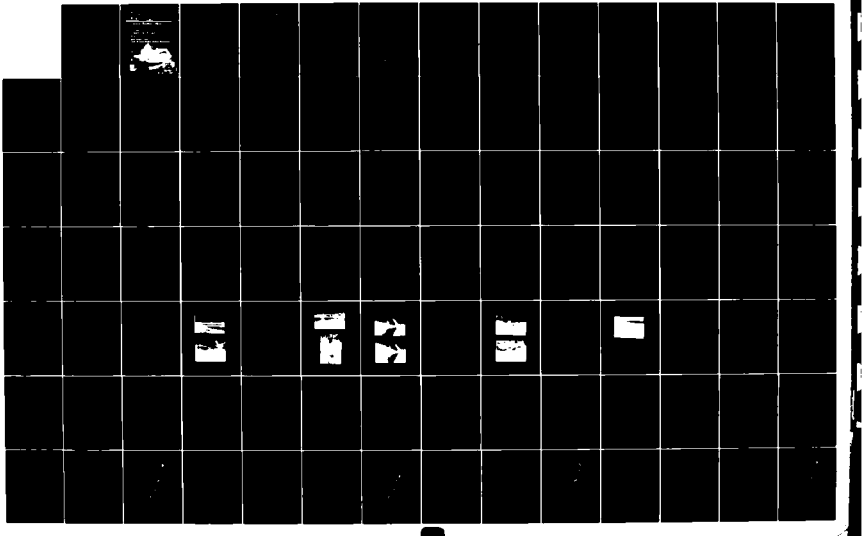

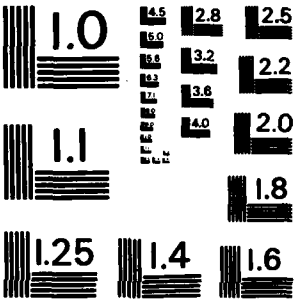

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Lorain Harbor
Commercial Navigation

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report documents the results of ~~the~~ study ~~which is conducted regarding~~ commercial navigation needs at Lorain, Harbor. ~~This~~ report evaluates various alternatives considering benefits, costs and social and environmental considerations inorder to develop a plan which warrants construction.

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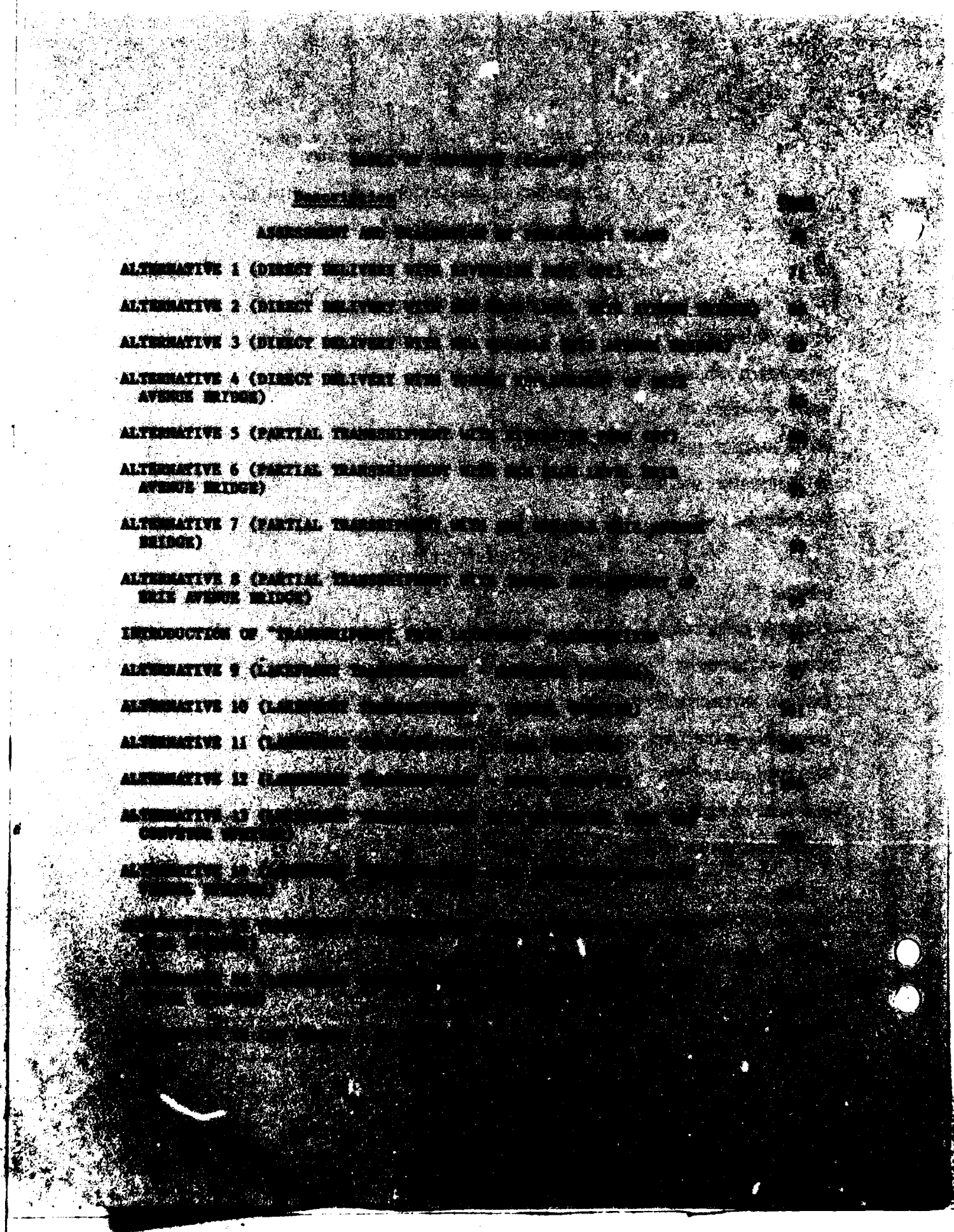

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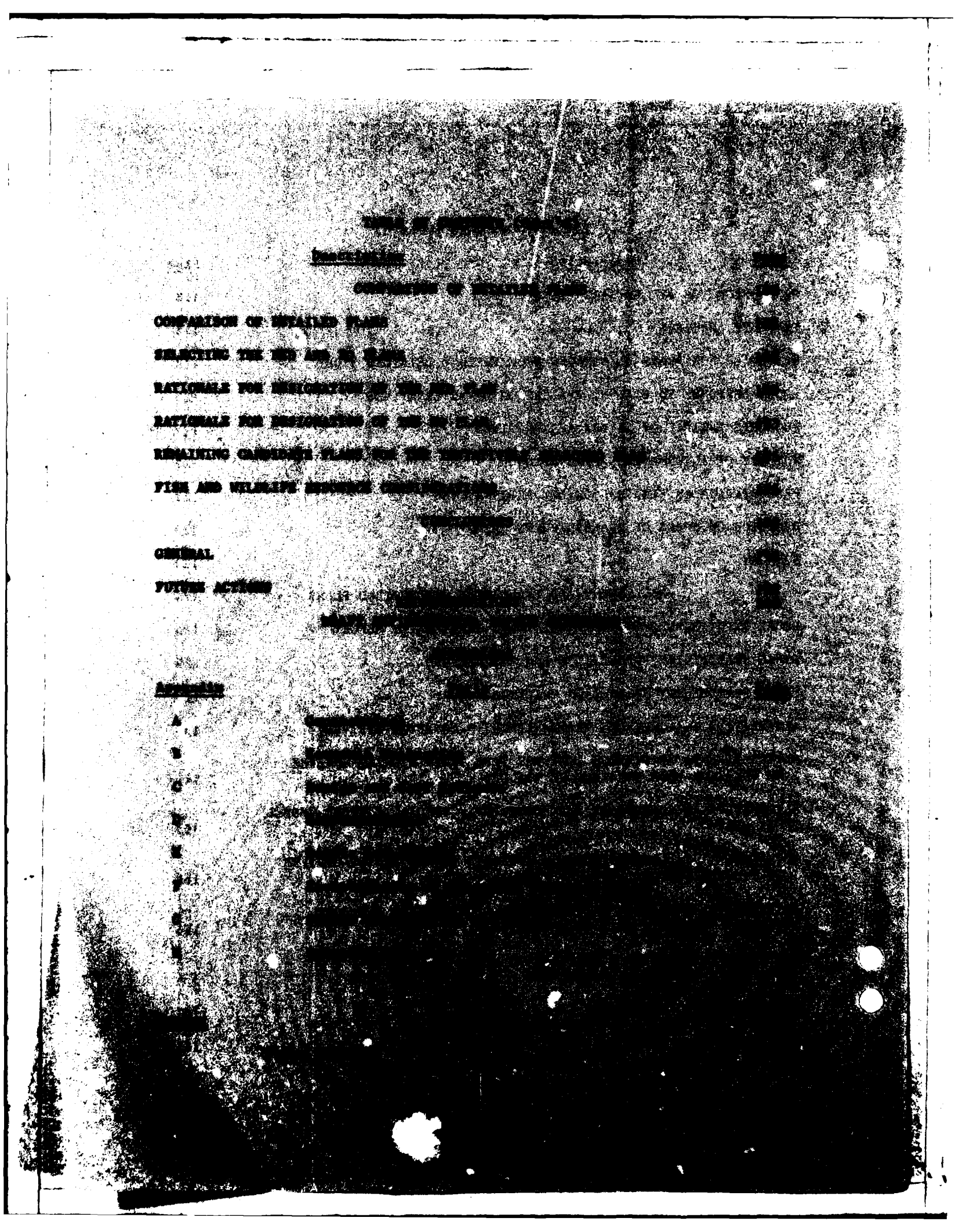

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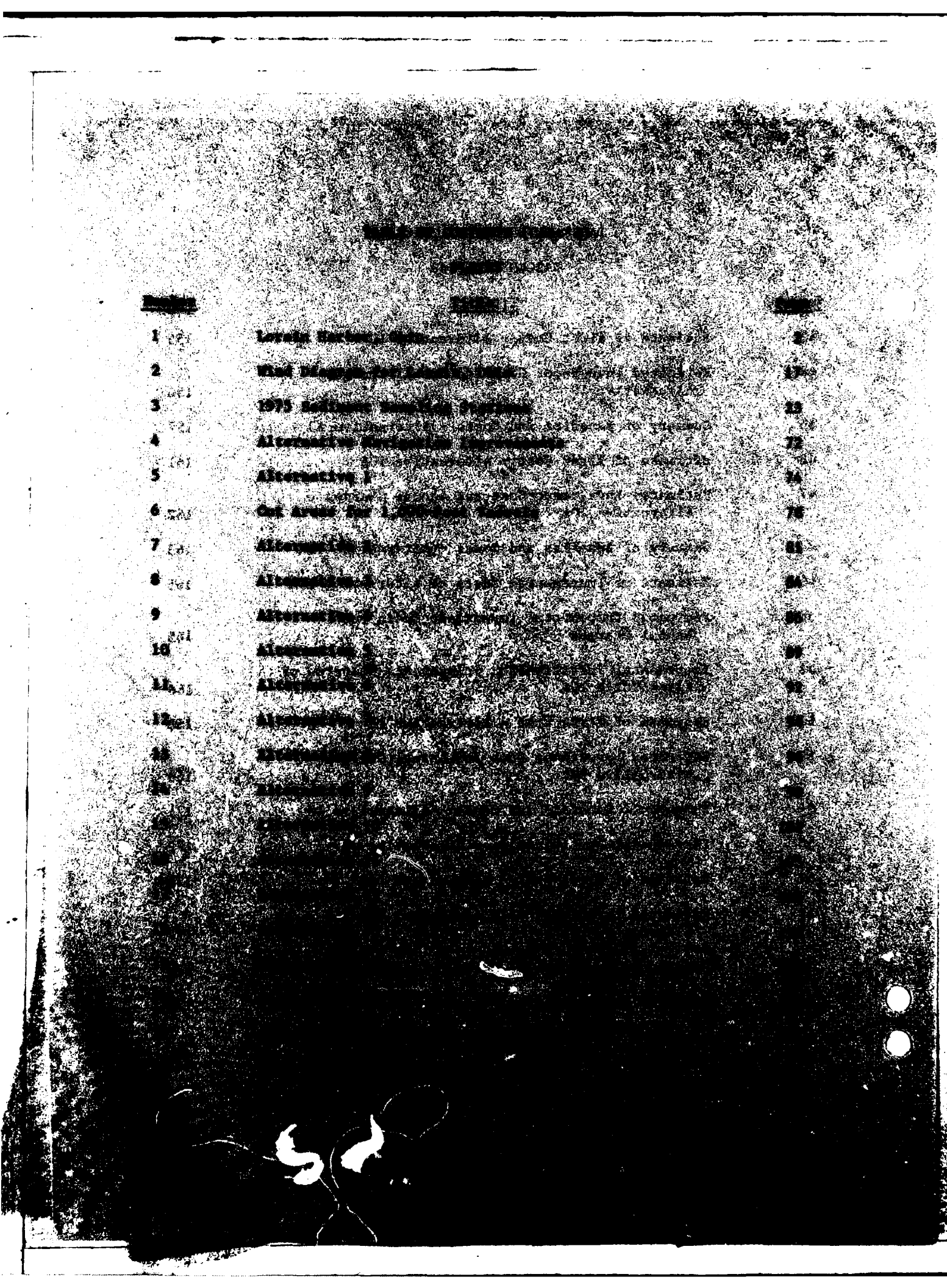

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INTRODUCTION

Lorain Harbor, located on the south shore of Lake Erie approximately 25 miles west of Cleveland, OH, and 90 miles east of Toledo, OH, accommodates the waterborne movement of bulk cargo to and from the city of Lorain and points inland. This harbor services local industry within Lorain and interior industrial and commercial areas in the hinterland of Ohio and adjacent States. Iron ore and limestone are the major cargoes handled. The present harbor configuration of the breakwaters and river channel limit the size of vessel or vessel drafts which can safely and efficiently move these commodities (see Plate 1). Significant transportation savings can be realized if the harbor were to be modified to permit the use of larger, more efficient vessels throughout the navigation season.

STUDY AUTHORITY

Recognizing the importance of commercial navigation to the economy of the nation, the Committee on Public Works and Transportation of the House of Representatives on 23 September 1976 passed the following resolution:

> "Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the report on Lorain Harbor, Ohio, published in House Document No. 166, 86th Congress, 1st Session, and other pertinent reports, with view of determining whether any modification to the recommendations contained therein is advisable at the present time, including consideration of the passage and safe navigation of new and larger ships operating on the Great Lakes."

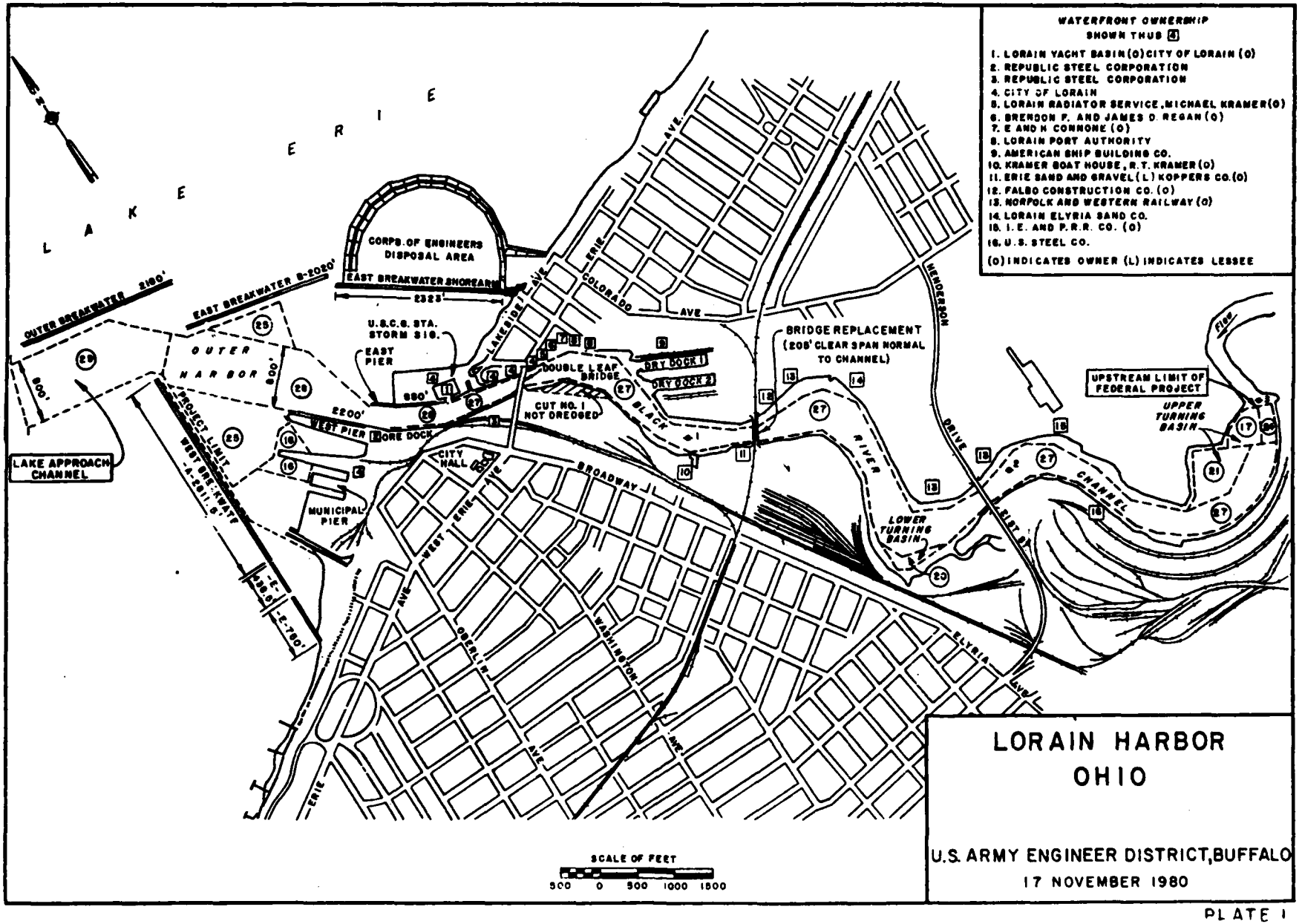
This quoted resolution is the authority under which this Feasibility Report is prepared.

GEOGRAPHIC AND ECONOMIC SETTING

Lorain Harbor, in the northcentral part of Ohio, consists of a lake approach channel, an Outer Harbor, and a navigation channel in the Black River which serves as the Inner Harbor, as shown on Plate 1. The Outer Harbor consists of a triangular shaped area of about 60 acres protected by four breakwater structures. The Inner Harbor consists of an improved navigation channel extending approximately 3 miles up the Black River.

SCOPE OF STUDY

As a result of public involvement and coordination activities undertaken during the preparation of the Reconnaissance Report, the following



LORAIN HARBOR
OHIO

U.S. ARMY ENGINEER DISTRICT, BUFFALO
17 NOVEMBER 1980

PLATE 1

principal water resources problems and needs at Lorain Harbor were identified for further study:

a. Harbor modifications for commercial navigation;

b. Additional marina facilities to serve existing and future demands for recreational small craft and;

c. Reduction of sedimentation on the Black River, and thus reduction in harbor maintenance dredging and improved water quality.

The objectives of this volume of final feasibility study on commercial navigation are: (1) to evaluate the recommended alternatives resulting from Preliminary study for commercial navigation modifications at Lorain Harbor considering benefits, costs, social and environmental implications, and constraints that might be imposed on improvements in the interest of recreational navigation and sedimentation; and 2) to recommend the commercial navigation alternative which warrants construction.

The needs of additional marina facilities to serve recreational navigation demand and the reduction of sedimentation on the Black River to reduce the harbor maintenance dredging will be addressed as separate volumes in this Feasibility study on Lorain Harbor. The study on recreational navigation is contained in Volume 2 of this report and the sedimentation and erosion study is contained in Volume 3.

STUDY PARTICIPANTS AND COORDINATION

An Orientation Workshop for the Lorain Reconnaissance Report took place on 27 April 1978. (See Appendix B of Reconnaissance Report dated September 1978 for summary minutes.) The Initial Public Meeting for the Reconnaissance study was held on 31 May 1978. An Information Workshop on the design alternatives for the harbor took place on 10 July 1979. The purpose of the Preliminary workshop was to present the preliminary designs and cost estimates to the principal study participants. These meetings afforded interested parties and the general public an opportunity to express their views concerning the improvements desired and the need and advisability of execution. These meetings were attended by four basic interest groups. These groups were: (1) commercial and industrial interests; (2) social, environmental, and recreational interests; (3) local government and planning interests; (4) general public interests.

At the end of the preparation of the Preliminary Report, a commercial navigation workshop meeting was held at the Lorain City Hall on 4 February 1981 to discuss the findings of the Preliminary study with local interests. Minutes of this meeting are contained in Appendix E. This meeting resulted in the District examining alternatives which would result in bringing 1,000-foot vessels upriver to the storage area on the west bank across from Amship.

A second commercial workshop was held on 7 April 1981 to present the findings of the evaluation of the new alternatives put forth by local interests at the 4 February 1981 meeting. The locals were informed that the preliminary

screening of the new alternatives presented at the 4 February 1981 meeting warranted additional study in the Feasibility study. Minutes of this meeting are contained in Appendix E.

Coordination has been maintained during development of this Final Feasibility Study and will continue to be maintained with Federal, State, regional, county, town, city agencies and departments, and with private interests affected by water resource actions at Lorain Harbor and the Black River.

The coordination has been facilitated by making written material available in advance of meetings. Suggested items for discussion and questions concerning the study were furnished so that meeting participants could be prepared with specific information. Flexibility has been maintained throughout the study to insure that the desires of the majority are made manifest and that the selected plan of action will be acceptable to their interests even if the no-action plan is selected.

PRIOR STUDIES AND REPORTS

Corps Studies For Lorain Harbor

A number of Congressionally authorized reports have been prepared by the Chief of Engineers concerning the need for navigation improvements in Lorain Harbor. A summary of these reports is provided in Table 1.

Table 1 - Prior Reports

Year of Rpt.	Work Considered	Congressional Document	Recommendation	Action By Congress, R&H Act
1897	Breakwaters and extension of piers to present dimension and dredging	H. Doc. 131, 55 Cong., 2nd Sess. and Ann. Rpt., 1898, p. 2718	Favorable	3 Mar 1899
1907	Widening Black River	H. Doc. 560, 60th Cong., 1st Sess.	Favorable	2 Mar 1907
1910	Extending breakwaters and dredging	H. Doc. 644, 61st Cong., 2nd Sess.	Favorable	25 Jun 1910
1913	Widening and straightening Black River	H. Doc. 160, 63rd Cong., 1st Sess.	Unfavorable	-
1916	Extending west breakwater	H. Doc. 980, 64th Cong., 1st Sess.	Favorable	8 Aug 1917
1916	Dredging certain parts of harbor to project depth	H. Doc. 985, 64th Cong., 1st Sess.	Favorable	8 Aug 1917
1918	Improvement of river above existing project	H. Doc. 1200, 65th Cong., 2nd Sess.	Unfavorable	-
1919	Improvement of river above existing project	House Committee 1, 66th Cong., 1st Sess.	Unfavorable	-
1919	Extending east breakwater and dredging	H. Doc. 254, 66th Cong., 1st Sess.	Unfavorable	-
1926	Extending project upriver	H. Doc. 587, 69th Cong., 2nd Sess.	Favorable	3 Jul 1930

Table 1 - Prior Reports (Cont'd)

Year of Rpt.	Work Considered	Congressional Document	Recommendation	Action By Congress, R&H Act
1932	Widening of two bends in river and enlargement of turning basin opposite Nat. Tube Co. dock	H. Doc. 469, 72nd Cong., 2nd Sess.	Favorable	30 Aug 1935
1932	Approach channel to municipal pier	Senate Comm. print, 73rd Cong., 2nd Sess.	Favorable	30 Aug 1935
1935	Deepening outer harbor, river channel, and turning basin	Rivers and Harbors Comm. Doc. 51, 74th Cong., 1st Sess.	Favorable	30 Aug 1935
1941	Turning basin in the bend of Black River immediately upstream from the Baltimore and Ohio RR Coal Dock	H. Doc. 161, 77th Cong., 1st Sess.	Favorable	2 Mar 1945
1954	Renovation of Lake View Park beach and construct three offshore breakwater structures to prevent beach erosion	H. Doc. 229, 83rd Cong., 1st Sess.	Favorable	3 Sep 1954
1958	Construction of detached breakwater lakeward of present entrance; breakwater removal; extension of east breakwater to shore; removal of outer 1,100 feet of the east pier; dredging entire harbor to greater	H. Doc. 166, 86th Cong., 1st Sess.	Favorable	14 Jul 1960

Table 1 - Prior Reports (Cont'd)

Year of Rpt.	Work Considered	Congressional Document	Recommendation	Action By Congress, R&H Act
	depths; and replacement of existing railroad bridge			
1960	Construct bank stabilization works at Cut No. 1 along left bank of Black River above Erie Avenue Bridge	PL 89-298	Favorable	27 Oct 1965
1970	Construction of 58-acre confined dredged material disposal area off the east breakwater shore arm	PL 91-611	Favorable	31 Dec 1970

Other Corps of Engineers Studies

Other completed and ongoing studies by the U. S. Army Corps of Engineers are pertinent to and may have an influence upon future considerations at Lorain Harbor. These are:

a. The Navigation Season Extension Study - The purpose of this study, completed in December 1979, was to determine the economic feasibility of extending the navigation season for all the Great Lakes and the St. Lawrence Seaway. Navigation on the GL/SLS occurs from about the first week in April to mid-to-late December. A limited 8-1/2 to 9-month season results in diseconomies to commerce and industry which resorts to stockpiling of raw materials or to more costly alternate transportation routes to sustain year-round operations. This report recommended a navigation season of 12 months on the upper lakes and 10 months on Lake Ontario and St. Lawrence River. The Final Feasibility Report has been completed and submitted to the Congress for information. Implementation of an extended navigation season may have a significant impact upon the physical, logistic, and economic considerations at Lorain Harbor and must be considered in future feasibility studies at this harbor.

b. The Great Lakes Connecting Channels and Harbors Study - This study covers the upper Great Lakes Region (Lakes Superior, Michigan, Huron, and Erie). The purpose of this study is to determine the feasibility of modifications to the existing commercial navigation system. Inasmuch as waterborne commerce at Lorain involves interlake commodity transport, recommendations

for size and draft requirements at the conclusion of the Connecting Channels and Harbors Study must be considered in the formulation of alternative futures and their economic impact on navigation demands to be made upon Lorain Harbor and the existing harbor channels. This study has recently begun work towards the Final Feasibility Report which is scheduled for completion in FY 85. The results of studies to date indicate that a second Poe Sized lock at the Soo Locks is warranted. This plan is based on the current system maximum vessel size (1,000-foot vessels) and the current system depth of 27.0-feet and would prolong any capacity constraint at the Soo Locks which would affect Lorain Harbor traffic projections within the 50-year project life.

c. St. Lawrence Seaway, Additional Locks Study - The purpose of this study was to determine the adequacy of the existing locks and channels in the U.S. section of the St. Lawrence River with respect to present and future commercial navigation needs and the advisability of their rehabilitation, enlargement or augmentation. Buffalo District has, in conjunction with the Connecting Channels Study in Detroit, prepared a Preliminary Report in 1982 which recommends construction of additional locks capable of handling either Seaway Size (730 feet long) or Poe Size (1,000-foot long) vessels, to replace or augment the existing locks in the St. Lawrence Seaway. This report concludes that ship sizes larger than 1,000-foot long and channels deeper than 27.0 feet are not economically feasible.

d. The Maximum Ship Size Study - This study was completed in 1977 by North Central Division, Corps of Engineers, to screen vessel size and improvement alternatives for use as input in the Great Lakes Connecting Channels and Harbors and the St. Lawrence Seaway Additional Locks Studies. Forecasts of the number of maximum sized vessels, freight rates, and commodity movements within the GL/SLS future were utilized for the Lorain Harbor study.

e. The Great Lakes-St. Lawrence Seaway Traffic Forecast Study - This study produced a system-wide transportation planning tool useful for establishing the economic feasibility of future navigation improvements. The purpose of this study is to evaluate the effects navigation improvements, such as season extension, channel modifications, and harbor improvements, may have upon future commodity shipments and traffic. The model is an effort to lower the cost of simulating navigation improvements at the field level and to simulate the impact of increased traffic service. The model measures the effect on tonnage levels of potential system-wide improvements, thus influencing the traffic and benefits derived from the proposed improvement. Distribution of traffic forecasts between individual harbors within port ranges (port split traffic forecasts) are also produced to evaluate the economic impact of future traffic flows and will represent a check upon other sources of traffic forecasts for Lorain Harbor.

f. Energy Impact Study for Great Lakes-St. Lawrence Seaway Navigation Season Extension Program - This study was prepared by the Detroit District Corps of Engineers to investigate the effects of waterborne transportation on national energy consumption. This study was initiated during the preparation of the Season Extension Study and its conclusions will be reviewed for application to potential improvements to Lorain Harbor.

Studies By Others

a. The Great Lakes Cooperative Port Planning Study - This study was prepared by the Great Lakes Regional Office of the Maritime Administration U.S. Department of Transportation in Cleveland, OH. It is a comprehensive study of Great Lakes bulk-handling facilities, waterborne traffic, competition between Great Lakes ports and other coastal ports, general cargo shipments, port financing, and marketing programs. Lorain Harbor is included in this study as one of the major bulk cargo ports.

b. Small-Boat Harbor Study - This study was prepared in 1978 by a Contractor under the supervision of the Lorain Community Development Department. This report investigates the recreation potential of the Lorain Harbor area, including the Corps 58-acre dredge disposal area immediately east of the harbor. A preliminary evaluation of the financial feasibility of a local operator of a hypothetical marina facility was also performed.

THIS REPORT

In the interest of clarity or presentation and reference, this Final Feasibility Report has been arranged into a Main Report and appropriate appendices. The Main Report is written to give both the technical reviewer and the general reader a clear understanding of the study, the study results, and the key conclusions and decisions reached regarding possible harbor modifications in the interest of commercial navigation.

The Main Report describes the resources and economy of the study area; identifies problems and needs; formulates a full range of possible harbor modification alternatives; and identifies feasible and economically justified improvements. It also includes, in summary form, the costs and benefits of the various alternatives, and the division of project responsibility between Federal and non-Federal interests for the feasible and economically justified improvements. Also, the report includes the recommendations of the District Engineer.

The appendices to the report present supporting data and details covering the plans presented in the Main Report and are displayed under separate cover. Appendices A through H are of primary interest to the technical reviewer and are summarized here for informational purposes.

Appendix A contains geotechnical design information. Appendix B provides an economic evaluation of the alternatives under consideration. Appendix C summarizes designs and cost estimates of project features and plans for commercial navigation improvements. Appendix D contains pertinent correspondence related to this report. Appendix E contains information related to Public Involvement. Appendix F contains the U.S. Fish and Wildlife Service Coordination Act Report on the commercial navigation study. Appendix G concerns the investigation of alternative sites for disposal of dredged material. Appendix H contains information related to cultural resources. The Draft Environmental Impact Statement (yellow pages) contains the results of the environmental studies and the effect the proposed plan would have on the human and natural environment. Appendix I presents rationale on the issues of Fish and Wildlife Mitigation and Enhancement.

PROBLEM IDENTIFICATION

GENERAL

The purpose of this section is to familiarize the reader of the problems concerning commercial navigation, in the Lorain Harbor area. This section presents information concerning the existing physical, human and biological environment in the general area; discusses the need for identifying methods of improving the ease and safety for commercial navigation; reviews the planning constraints under which this study was conducted; discusses the specific planning objectives of the study; and reviews the conditions that would exist if no Federal action is taken.

EXISTING CONDITIONS

Physical Environment

Regional Geology

Physiography - Lorain Harbor is at the mouth of the Black River at Lorain, OH. The Black River drains a portion of the Central Lowlands Physiographic Province. This is an area characterized by a flat lying lake plain crossed by sandy ridges of former glacial lakes and by gently rolling moraines. The greatest relief occurs along the Lake Erie shoreline where bluffs rise 30 to 50 feet, and in the major stream valleys.

Bedrock Geology - Bedrock in the region consists of Paleozoic shale, siltstone, sandstone, and carbonate rock. In western Ohio, there is a broad low dome known as the Cincinnati Arch which has a north trending axis. The rocks in the vicinity of the structure have a gentle southeastward dip of about 20 feet per mile.

Surficial Geology - Unconsolidated material consists of glacial till, glaciofluvial and lacustrine deposits, and alluvium. Much of this material was deposited during the Late Pleistocene.

Local Geology

Bedrock Geology - Bedrock is exposed throughout most of the Black River Valley. From Elyria downstream, the Devonian Cleveland Shale is exposed. When freshly exposed it is bluish black to brownish black and turns coffee brown upon weathering. In fresh exposures, the shale is very compact and massive to platey but after slight weathering it becomes thinly laminated, fissle, and brittle. Upon extreme weathering it turns dark gray and breaks down into flakey pieces but does not acquire the real plasticity of a clay shale. Primary and secondary deposits of pyrite are present in considerable quantities along the laminae as concretionary masses or as finely disseminated pyrite. When the shale is chipped it gives off a gaseous odor. Borings taken in the Lorain Harbor vicinity show that usually the upper 10 feet of rock is weathered and that some vertical jointing is evident.

Upstream of Elyria are rocks of Mississippian Age. The oldest of these is the Bedford shale. This is a grayish to dusky red shale with abundant gray shale or sandstone and siltstone lenses. The shale weathers rapidly to a sticky red mud and forms outcrops that are obscured by slumping and soil creep.

Surficial Geology - The unconsolidated deposits of the Black River Basin consist mostly of till. Goldthwart and others (1965) characterize till in this area as brown clay till. Overlying the till in many areas is a lacustrine clayey silt and sandy beach ridges. These ridges are conspicuous remnants of former glacial lakes. Forsyth (1959) has identified the major ridges as those of Lakes Lundy, Wayne, Warren, Whittlesey, and Maumee I, II, and III.

Alluvial sand and gravel deposits are not as common in the Black River as in other Ohio streams. Most of the alluvium is found in the lower reaches and in the headwaters of its tributaries where the stream cuts through gravelly morainal deposits.

Borings taken by others in the lower reach of the river at Lorain show the soil to consist of alluvial clays with low plasticity and containing traces of sand and organic matter. This is underlain by a dense, silty gravel which directly overlies rock. A more detailed description of the geology of the area is contained in Appendix A.

Water Bodies

Lake Erie - is the shallowest of the Great Lakes, with a depth of less than 80 feet over 90 percent of its entire surface area of 9,919 square miles. Maximum depth is 210 feet and the average depth is 60.7 feet. The lake is divided into three basins: western, central, and eastern, as shown on Figure 1.

The central basin extends along the northeast Ohio shore, adjacent to the project area and is by far the largest of the three, covering approximately 6,300 square miles. Its average water depth is 60 feet, with a maximum of about 84 feet. The shores are generally high clay banks with narrow beaches. In winter, the central basin becomes entirely ice covered with 95 percent coverage of the entire lake during some severe winters.

Because of the central basin's large cross section, its flow-through current is immeasurably slow and circulation is controlled by the wind. Although reversals are common with wind shifts, the predominant surface water movement, as shown on Figure 1, is eastward, angling away from the north shore toward the south shore. The predominant bottom water flow is southwestward.

Black River - The Black River, including the East and West Branches, has a total drainage area of 470 square miles. The East Branch of the Black River, which originates just south of the Lorain County line, flows through hilly terrain, which is predominantly farmland. The West Branch meanders through forest land before merging with the East Branch in Elyria. The

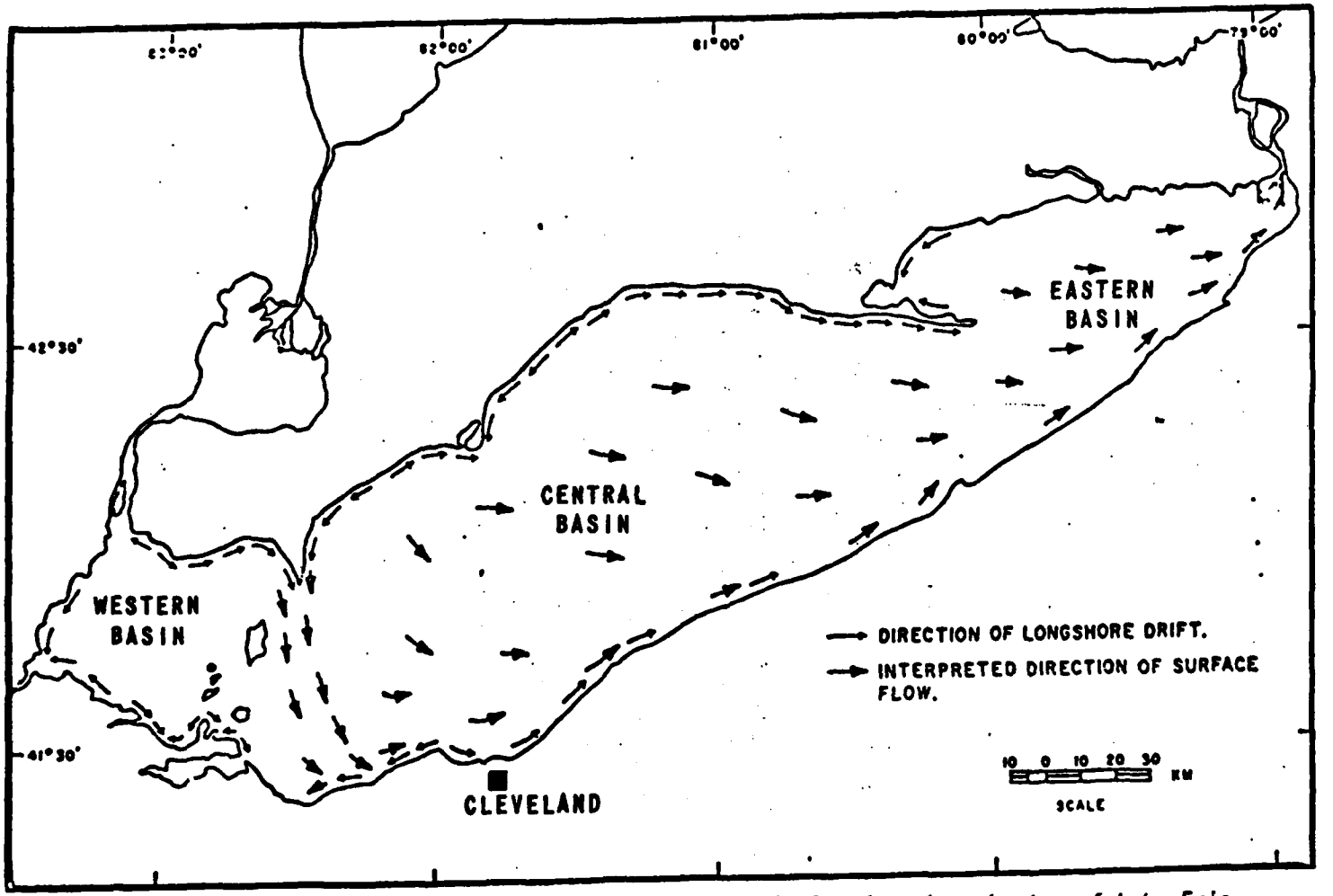


FIGURE 1 The permanent surface circulation of the central and eastern basins of Lake Erie.

SOURCE: "Final Environmental Statement, Cleveland Harbor Operations and Maintenance, Cuyahoga County, Ohio", U.S. Army Engineer District, Buffalo, N.Y., April 1974.

mainstream, flowing northward, divides the city of Lorain and empties into Lake Erie at Lorain Harbor.

A U.S. Geological Survey recording gage is located on the Black River at Elyria, OH, and measures 396 square miles of drainage upstream from this location. The average stream flow as recorded at this gage is 314 cubic feet per second and the maximum recorded discharge was 51,700 cubic feet per second in July 1969.

Water Levels and Fluctuations - The water levels in the Outer Harbor and in the lower Black River to the upper limit of the Federal project (approximately to stream mile 3) vary with and are approximately the same as the levels of Lake Erie. All project depths at Lorain Harbor refer to Low Water Datum (LWD) for Lake Erie, which is 568.6 feet above mean water level at Father Point, Quebec (International Great Lakes Datum 1955 (IGLD-1955)). (Figure 2)

Water levels on the Great Lakes vary from year to year and from month to month. Locally, water levels vary from day to day and from hour to hour. The lake level is subject to a seasonal rise and fall usually consisting of high levels in May and June and low levels in January and February. Yearly and seasonal fluctuations are caused by variations in precipitation rates within the Great Lakes Basin. Short-term fluctuations lasting from a few hours to several days are caused by meteorological disturbances. Differences in barometric pressure and winds blowing over the surface of the lake create temporary water level fluctuations which vary locally. Astronomical tides are assumed to have a negligible influence on water levels at the project site.

Continuous records of water levels in Lake Erie have been monitored at Cleveland, OH, by the Lake Survey Center and National Oceanic and Atmospheric Administration (NOAA) since 1860. These readings are considered to be representative of Lorain Harbor. The gage at Cleveland serves as the master gage for Lake Erie. Table 2 summarizes the average and extreme water levels recorded by the Cleveland water level gage. In the 122 years of record at the Cleveland gage, from 1860 to 1981 inclusive, the level of Lake Erie has fluctuated from a high monthly mean of 573.5 feet in June 1973 to a low monthly mean of 567.5 feet in December 1934 and again in February 1936. The greatest annual fluctuation, as shown by the highest and lowest monthly mean of the year, was 2.75 feet in 1947, and the least annual fluctuation was 0.87 foot in 1895. In the last 5 years of record (1977 to 1981), the maximum monthly mean stages have ranges from +3.96 feet in June 1980 to +3.34 feet above low water datum in May 1977. The minimum monthly mean stages have ranged from +2.55 feet in December 1980 to +1.62 feet above low water datum in February 1977. Similar fluctuations are assumed to occur during the life of the project.

Table 2 - Average and Extreme Water Levels

LAKE ERIE WATER LEVEL DATA
AT
CLEVELAND, OH
PERIOD 1860-1981

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Stage	1973	1973	1973	1973	1973	1973	1973	1973	1973	1973	1972	1972
High	572.39	572.53	572.88	573.30	573.25	573.51	573.34	573.03	572.51	572.14	572.17	572.35
Mean	569.98	569.94	570.18	570.71	571.04	571.18	571.14	570.95	570.67	570.34	570.08	570.01
	1935	1936	1934	1934	1934	1934	1934	1934	1934	1934	1934	1934
Low	567.62	567.49	567.65	568.20	568.43	568.46	568.46	568.36	568.23	567.95	567.60	567.53

CHANGES

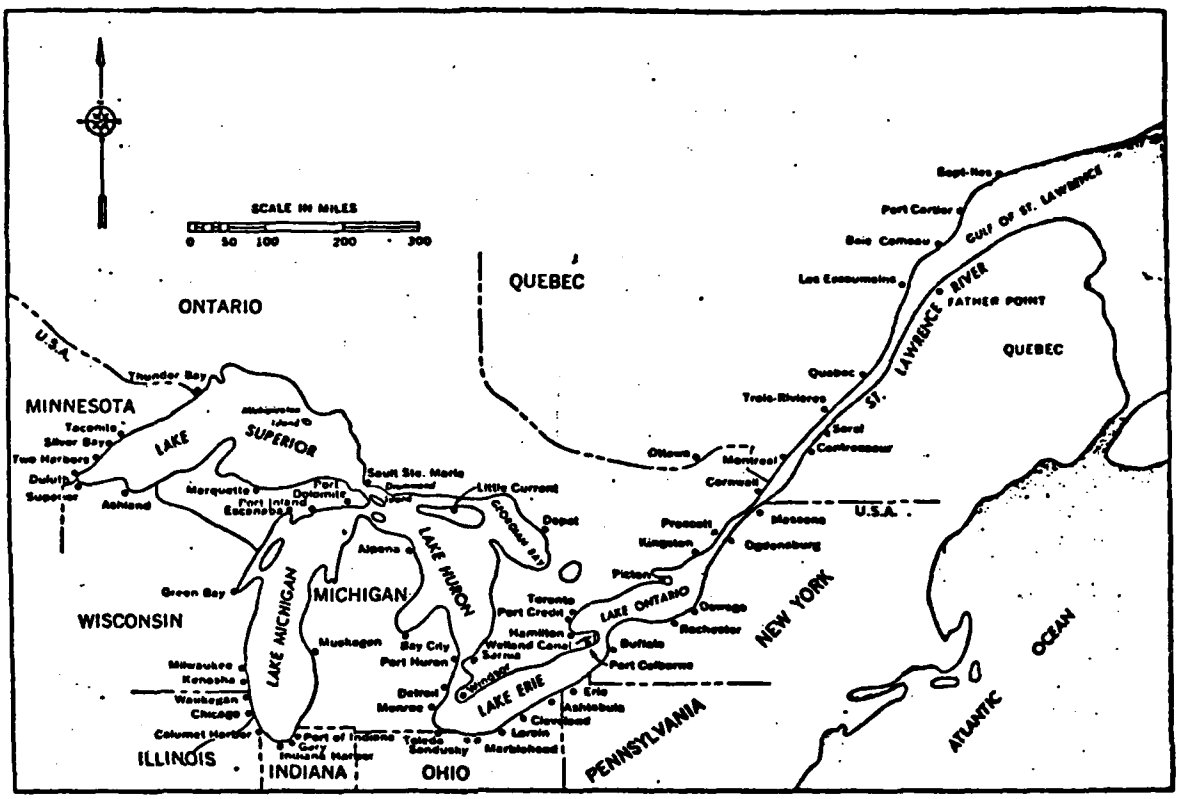
	Jan-Feb	Feb-Mar	Mar-Apr	Apr-May	May-Jun	Jun-Jul	Jul-Aug	Aug-Sep	Sep-Oct	Oct-Nov	Nov-Dec	Dec-Jan
	1952	1976	1913	1947	1892	1902	1915	1926	1926	1917	1927	1949-50
Maximum Rise	+0.67	+1.12	+1.57	+0.95	+0.76	+0.63	+0.26	+0.13	+0.28	+0.14	+0.52	+0.78
Average	-0.04	-0.24	+0.53	+0.32	+0.15	-0.04	-0.19	-0.28	-0.33	-0.27	-0.06	-0.03
	1886	1931	1891	1891	1977	1890	1868	1937	1871	1924	1882	1917-18
Maximum Fall	-0.73	-0.31	-0.13	-0.18	-0.24	-0.38	-0.52	-0.57	-0.67	-0.64	-0.51	-0.67

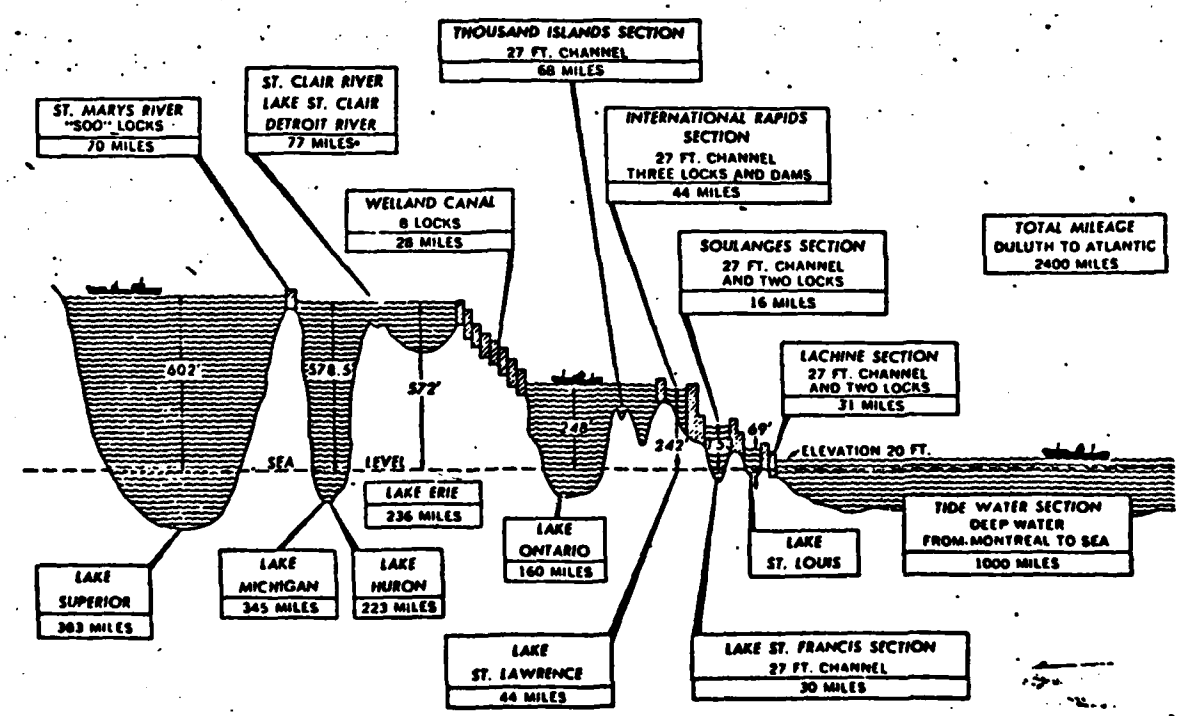
Ave. 1860-1981 570.52
Ave. 1900-1981 570.38

LWD 568.6

July 1982

FIGURE 2 THE GREAT LAKES-ST. LAWRENCE NAVIGATION SYSTEM
GEOGRAPHIC EXTENT AND PROFILE





Wind and Waves - Wave records are not available in the immediate vicinity of Lorain Harbor.

Wind velocity generally is moderate, averaging 12.8 miles per hour; the prevailing wind directions are west and southwest, as shown on Plate 2.

The predominant regional littoral drift is from east to west, with localized west to east drift just west of the harbor due to the sheltering effect of the harbor structures.

Water Depths - The outer harbor and Black River navigation channel depths, based on Low Water Datum, 568.6 feet above LWD, are authorized and maintained by the Corps dredging program as follows (Plate 1):

Lake Approach Channel	29 feet
Channel Across Outer Harbor	28 feet
Turning Area in Outer Harbor	25 feet
Approach Channel to Municipal Pier	16 feet
Channel at River Entrance	28 feet
Black River Channel	27 feet
Lower Turning Basin	20 feet
Upper Turning Basin	17-21 feet

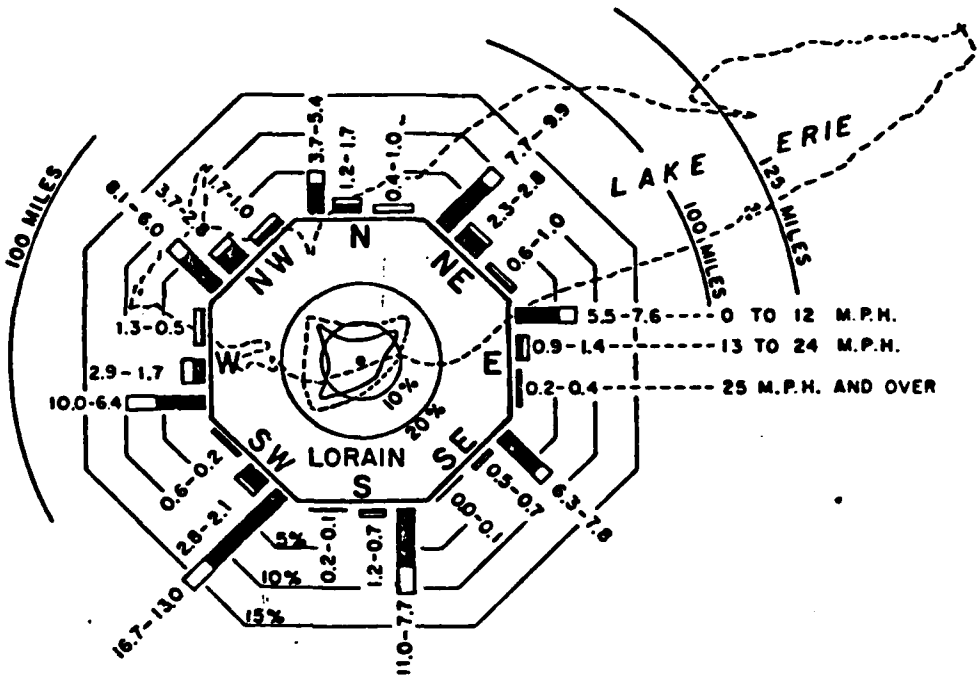
Exposure and Effect of Storms - The Outer Harbor entrance opens to the northwest but is partially protected by a detached Outer Breakwater 2,180-foot-long lying in an east-west direction. This Outer Breakwater affords protection to the harbor entrance from northerly winds; but subjects the harbor entrance to southwesterly, westerly, and easterly storms. These storms cause heavy wave action and currents at the harbor entrance which, when coupled with the wind forces against the large, exposed superstructure of large vessels, could impose formidable navigational problems.

Within the Outer Harbor, waves reflecting from the east breakwaters also create hazardous conditions for docking at the Outer Harbor facilities without the use of tugs. Navigation difficulties were experienced by the "Roger Blough," a Great Lakes bulk freighter 858 feet in length and 105 feet wide. Therefore, it may reasonably be assumed that larger vessels presently operating on the Great Lakes (i.e., up to 1,000 feet in length, 105 feet in width), would also experience similar difficulties. These needs are discussed in greater detail in the PROBLEMS, NEEEDS AND OPPORTUNITIES Section of this report.

Water Quality - The U. S. Environmental Protection Agency (EPA) conducted numerous water quality surveys in the Black River Basin from 1972 to 1979. An intensive survey of the lower Black River was completed from 16-19 July 1979 and included most of the sampling points employed in 23-26 July 1974 intensive surveys. Since there were no significant differences in waste treatment at the Elyria Sewage Treatment Plant (STP) located 11 miles upstream, and U. S. Steel, the stream quality data obtained in 1979 were quite similar to those obtained in 1974.

Major findings of the survey include:

a. There were 159 known point source discharges within the Black River planning area, including 114 public and semi-public sewage treatment plants,



WIND DIAGRAM FOR LORAIN HARBOR, OHIO

NOTES

- ■ INDICATES DURATION FOR ICE-FREE PERIOD (MAR. TO DEC. INCL.) IN PERCENT OF TOTAL DURATION.
- ▭ INDICATES DURATION FOR ICE PERIOD (JAN. TO FEB. INCL.) IN PERCENT OF TOTAL DURATION.
- ~ INDICATES PERCENT OF TOTAL WIND MOVEMENT OCCURRING DURING ICE-FREE PERIOD.
- ····· INDICATES PERCENT OF TOTAL WIND MOVEMENT OCCURRING DURING COMBINED ICE AND ICE-FREE PERIODS.

FIGURES AT ENDS OF BARS INDICATE PERCENT OF TOTAL WIND DURATION FOR ICE-FREE PERIOD AND COMBINED ICE-FREE AND ICE PERIODS, RESPECTIVELY.

WIND DATA BASED ON RECORDS OF THE U.S. COAST GUARD AT LORAIN HARBOR, OHIO FOR PERIOD 1 JAN. 1938-31 DEC. 1971

38 industrial facilities, and 7 water treatment plants. Four facilities discharged directly to Lake Erie, 127 discharged to streams with water quality design flows of 0 cubic feet per second (cfs), and 28 discharged to lake-affected areas of the Black River or to streams having a significant water quality design flow.

b. Upstream of Elyria, most streams had good quality water and were in substantial compliance with Ohio water quality standards. Violations of the cadmium and lead standards were found at several locations, apparently the result of agricultural non-point source pollution. Bacterial standards were exceeded throughout the basin due to the discharge of inadequately disinfected sanitary wastes.

c. Large discharges of ammonia and other oxygen-demanding materials from the Elyria sewage treatment plant cause continuing and substantial violations of Ohio Water Quality Standards for ammonia and dissolved oxygen in the main stem of the Black River. Thermal discharges from the U.S. Steel Lorain Works cause violations of the temperature standards in the Black River, and, the discharge of oxygen demanding wastes from this facility contribute to the violation of dissolved oxygen standards. In addition, the oil discharge from U.S. Steel Outfall 001 is causing violations of Section 3745-1-04 (B) of the Ohio Water Quality Standards, despite being in compliance with current NPDES permit conditions. Upon reaching design flow, the discharge from the French Creek Sewage Treatment Plant will become a significant factor in the dissolved oxygen balance in French Creek and in the Black River.

d. The classification of the main stem of the Black River as "water quality limiting" is warranted since conventional municipal secondary treatment for the Elyria and French Creek sewage treatment plants, and BPCTCA (best practical control technology currently available) for the U.S. Steel Lorain Works are not adequate to achieve water quality standards. Most remaining streams in the planning area should be similarly classified due to their low water quality design flows.

e. With minor exceptions, Ohio's warm water habitat use designation and associated water quality criteria are achievable throughout the planning area with well demonstrated, conventional industrial and municipal treatment technologies. The seasonal warm water habitat use designation is appropriate for limited reaches below the Brentwood Estates, Eaton Estates, Grafton, Lagrange, Lodi, and Oberlin Sewage Treatment Plants.

f. Maximum and average temperature standards for the lower Black River for the period 15 April to 15 June should be increased $3^{o}F$ to reflect the response of the river to weather conditions and the recommended reduced thermal loadings at the U.S. Steel Lorain Works.

The data from the 1979 survey demonstrated a significant increase in stream temperature caused by the U. S. Steel Lorain Works and highlighted the impact of the Elyria STP and U.S. Steel discharges on decreased dissolved oxygen levels in the lower river. Concentrations as low as 2 to 3 milligrams per liter were recorded despite a river flow of 168 cfs. Problems with ammonia,

cyanide and phenolics were also noted in the river. A total cyanide concentration of 230 ug/l was recorded near U.S. Steel while the present water quality standard is 25/ug/l. Relatively high levels of metals were also detected. An intrusion of lake water into the Black River was demonstrated. Currently, U.S. Steel and the Lorain STP contribute approximately 95 to 98 percent of the permitted discharges into the lower 3 miles of the Black River. Table 2a presents the NPDES permit discharges in the study area.

States are required to classify streams or segments of streams as either "water quality" or "effluent" limiting. Effluent limiting segments are those where applicable water quality standards are being met, or there is certainty that these standards will be achieved by application of effluent limitations. Water quality limiting segments are those where standards are not being achieved and where application of the above treatment levels is not sufficient to achieve water quality standards. The Black River main stem from the mouth to the confluence of the East and West Branches, has been classified as water quality limiting for the following parameters: dissolved oxygen; oil and grease; cyanide; phenolics; and ammonia. (Source: Black River Waste Load Allocation Report, prepared by U.S. Environmental Protection Agency, 1980).

Sediment Quality - Sediment testing in Lorain Harbor was conducted by the U.S. Environmental Protection Agency (USEPA) in 1975 and by the Buffalo District Corps of Engineers in November 1981. The results of the EPA tests are shown in Table 3. Plate 3 shows the locations where sediment samples were taken.

Based on USEPA's 1975 testing, the entire harbor, except for a small portion located in the lake approach channel, has been determined to be polluted and, therefore, unacceptable for open-water disposal. These polluted dredgings are placed in the diked disposal area adjacent to the Lorain Harbor East Breakwater Shorearm. Dredgings from the remaining portion of the harbor that were tested in 1975 may be disposed of at the designated open-lake site. This decision, made by USEPA, was based on chemical and biological data as well as field observations. All sites tested by the Buffalo District COE, inside the East Breakwater in 1981 indicate the sediments are highly polluted for cyanide, phosphorus and arsenic. Some sites are highly polluted for Chemical Oxygen Demand (COD), Total Nitrogen Kjeldahl (TKN), copper, iron, manganese and zinc. Some sites are moderately polluted for COD, oil and grease, TKN, chromium, copper, iron, lead, manganese, nickel and zinc. No significant concentrations of organic compounds, including mirex, DDT, and PCB's were detected at any of the sites sampled by Buffalo District in 1981.

Based on these results, the upper 2 feet of channel bottom material in that portion of the harbor to be deepended has been determined to be polluted and therefore unacceptable for open-lake disposal. Dredgings below that depth and from the remaining portion of the Outer Harbor may be disposed of at the established open-lake disposal site. This decision, discussed in Appendix G is based on USEPA criteria related to chemical and biological data as well as field observations.

Maintenance Dredging - The Federal project at Lorain Harbor is dredged periodically by hopper type dredges. Historical quantities removed during

these operations are summarized in Table 5 for the period 1967 through 1981. The mean annual volume dredged has been approximately 154,000 C.Y. and is normally performed during a 2 to 4 week period between April and June.

Table 2a - Permitted Discharges for the Black River and Lake Erie

Discharger	Receiving Stream	Mile Point Main Stem	Flow (MGD)
Lorain Water Treatment Plant	Lake Erie	_	0.14
Ohio Edison-Edgewater Plant	Lake Erie	_	1.7
Lorain STP	Black River	0.2	14.3
Am Ship	Black River	0.7	0.5
Lorain-Elyria Sand Co.	Black River	1.3	0.5
Ashland OH, Terminal	Black River	1.7	*
Koehring Company, Plant No. 1	Black River	1.9	0.003
U.S. Steel (5 Outfalls)	Black River	2.56-5.0	171

* Flow is variable

SOURCE: Black River Waste Load Allocation Report USEPA, November 1980

Table 3 - Sediment Pollution Evaluation

HARBOR: Lorain

STATE: Ohio

SAMPLED: 25 February 1975

Evaluation Parameter	Guideline Values	Value at Each Station as a Percent of Dry Weight									
		LOR-6	LOR-8	LOR-9	LOR-10	LOR-11	LOR-12	LOR-13	LOR-15	LOR-16	LOR-17
Volatile Solids	6.0	7.43	6.77	6.29	5.33	8.12	4.37	8.53	8.78	9.07	9.94
Chem. Oxy. Demand	5.0	8.50	8.40	9.10	4.80	11.60	6.20	12.10	14.50	13.00	15.00
T. Kjel. Nitrogen	0.10	0.2700	0.2200	0.1800	0.1600	0.2500	0.1200	0.3200	0.3300	0.2400	0.3000
Oil - Grease	0.15	0.3000	0.4500	0.2800	0.1700	0.8400	0.1800	0.9000	0.9700	1.5000	2.3000
Mercury	0.0001	0.00001	0.00001	0.00002	0.00001	0.00002	0.00001	0.00003	0.00003	0.00004	0.00003
Lead	0.005	0.0062	0.0079	0.0069	0.0044	0.0120	0.0056	0.0164	0.0160	0.0216	0.0177
Zinc	0.005	0.0415	0.0470	0.0460	0.0360	0.0700	0.0370	0.0770	0.0900	0.1230	0.0980
Supplementary:											
T. Phosphorous,		0.0930	0.1300	0.1100	0.1000	0.1500	0.0950	0.2500	0.2300	0.2200	0.1900
Ammonia Nitrogen		0.0240	0.0280	0.0230	0.0200	0.0400	0.0120	0.0670	0.0340	0.0240	0.0310
Cyanide		0.000091	0.00031	0.000038	0.000056	0.00037	0.000066	0.0005	0.00023	0.00056	0.00177
Manganese		0.0840	0.0800	0.0740	0.0710	0.0860	0.0625	0.0885	0.0780	0.1010	0.1105
Nickel		0.0040	0.0035	0.0055	0.0060	0.0070	0.0050	0.0065	0.0085	0.0100	0.0075
Arsenic		0.0013	0.0016	0.0013	0.0012	0.0013	0.0013	0.0011	0.0016	0.0019	0.0015
Barium		0.0073	0.0070	0.0051	0.0052	0.0091	0.0042	0.0143	0.0125	0.0113	0.0034
Cadmium		0.00025	0.00077	0.00042	0.00058	0.0015	0.00046	0.0016	0.0018	0.0029	0.0023
Chromium		0.0061	0.0076	0.0064	0.0059	0.0125	0.0060	0.0126	0.0134	0.0182	0.0146
Magnesium		0.8200	0.7800	0.8300	0.8000	0.1200	0.7000	0.7100	0.5000	0.5900	0.5300
Copper		0.0133	0.0112	0.0117	0.0114	0.0182	0.0124	0.0325	0.0165	0.0268	0.0225
Iron		4.0800	4.0900	4.0700	4.1700	4.7600	3.2500	4.8100	4.7100	6.5500	6.0400

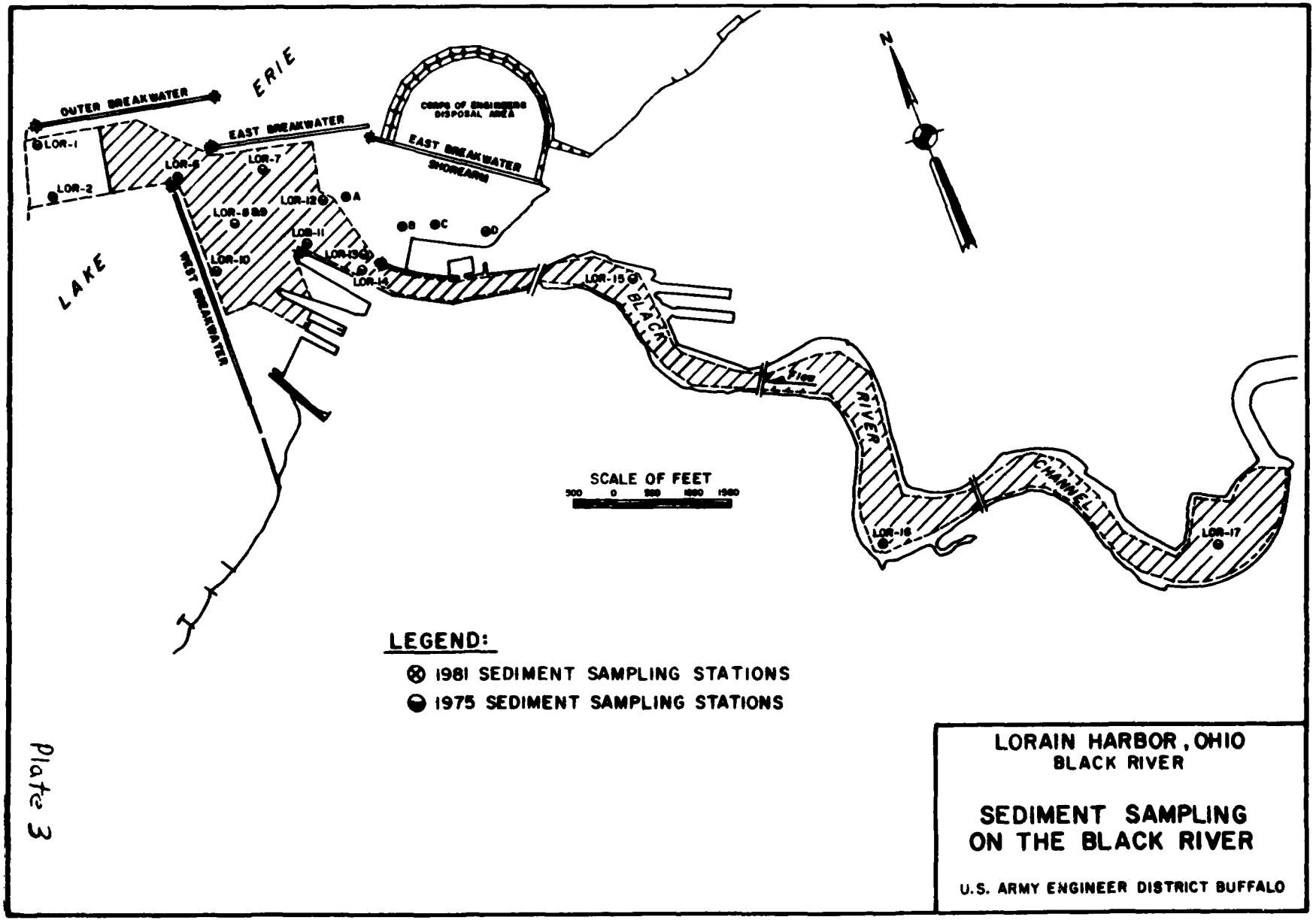
Table 4 - Sediment Pollution Evaluation Inside East Breakwater, November 1981

Parameter	EPA Region 5 Criteria			Stations			
	Nonpolluted	Moderately Polluted	Heavily Polluted	A	B	C	D
Volatile Solids (%)	<5	5-8	>8	3.52	2.42 (1)	2.82	1.70
Ammonia (mg/Kg)	<75	75-200	>200	13.0	18.85 (1)	12.1	10.9
COD (mg/Kg)	<40,000	40,000-80,000	>80,000	46,800	29,400 (1)	27,300	85,300
Phenols (mg/Kg)	-	-	-	2.3	8.2 (1)	1.1	<0.25
Cyanide	<0.10	0.10-0.25	>70.25	<0.60	<0.62 (1)	<0.60	<0.49
Phosphorus (mg/Kg)	<420	420-650	>650	878	768.5 (1)	1,530	766
Oil & Grease (mg/Kg)	<1,000	1,000-2,000	>2,000	1,411	811.5 (1)	1,020	472
Total Kjeldahl Nitrogen (mg/Kg)	<1,000	1,000-2,000	>2,000	3,190	1,045.5 (1)	20,660	15,290
Arsenic (mg/Kg)	<3	3-8	>8	15 (1)	13	17	12
Cadmium (mg/Kg)	-	-	>6	5.8 (1)	2.8	5.1	36
Chromium (mg/Kg)	<25	24-75	>75	38 (1)	24	33	16
Copper (mg/Kg)	<25	25-50	>50	51 (1)	29	43	23
Iron (mg/Kg)	<17,000	17,000-25,000	>25,000	44,000 (1)	21,000	44,000	34,000
Lead (mg/Kg)	<40	40-60	>60	32 (1)	27	48	25
Manganese (mg/Kg)	<300	300-500	>500	630 (1)	460	720	500
Mercury (mg/Kg)	-	≥1 (2)	≥1 (2)	0.13 (1)	0.044	0.11	0.058
Nickel (mg/Kg)	<20	20-50	>50	39 (1)	30	41	22
Zinc (mg/Kg)	<90	90-200	>200	195 (1)	200	250	160

(1) Mean of two replicate analysis.

(2) USEPA has only established one guideline value for mercury - "Polluted."

(Testing conducted by EG&G Bionomics, Wareham, MA, under contract by Buffalo District, COE, 1981.)


OUTER BREAKWATER
ERIE
EAST BREAKWATER
CORPS OF ENGINEERS DISPOSAL AREA
EAST BREAKWATER SHOREARM
LOR-1
LOR-2
LOR-6
LOR-7
LOR-8
LOR-8A
LOR-8B
LOR-12
A
B
C
D
LOR-11
LOR-10
LOR-13
LOR-14
LOR-15
LAKE
WEST BREAKWATER
BLACK
RIVER
CHANNEL
LOR-16
LOR-17
N
SCALE OF FEET
500 0 500 1000 1500
LEGEND:
1981 SEDIMENT SAMPLING STATIONS
1975 SEDIMENT SAMPLING STATIONS
LORAIN HARBOR, OHIO
BLACK RIVER
SEDIMENT SAMPLING
ON THE BLACK RIVER
U.S. ARMY ENGINEER DISTRICT BUFFALO

23

Plate 3

Occasionally, dredging operations have extended into November. A confined disposal area adjacent to the East Breakwater Shorearm was completed in 1978 to contain polluted dredged material. This structure has an estimated capacity equivalent to 10 years of normal dredging activity. This design standard is based on the assumption that, after 10 years, water treatment plants located upstream will help upgrade the quality of existing bottom sediments and implementation of land conservation measures will reduce the quantity and/or increase the quality of sediments within Federal channels to an acceptable level which will permit the resumption of open lake and/or shore area dumping.

Table 5 - Summary of Historical Dredging at Lorain, Ohio

Year	Cubic Yards	Year	Cubic Yards
1967	106,713	1974	498,586
1968	230,357	1975	134,986
1969	142,456	1976	42,290
1970	189,414	1977	30,420
1971	136,021	1979	192,048
1972	143,598	1980	96,194
1973	83,922	1981	132,844
		Total	2,159,844
		Annual Average	154,000

Climate - The climate of Lorain is humid and temperate and the region is characterized by large annual and daily temperature ranges, although the presence of Lake Erie tends to moderate the temperature. The average January temperature is 27.7°F and July temperature is 72.9°F. The highest temperature recorded is 105°F and the lowest is -23°F.

Cold air masses come from Canada during the winter months but are modified by the relatively warm waters of Lake Erie, resulting in cloudiness and frequent snow from November through March.

Precipitation is well distributed throughout the year with an annual average precipitation of 35 inches, and about 17 inches occurring as rainfall during the growing season.

Air Quality - According to an Ohio EPA publication titled "Ohio Air Quality - 1979," prepared by the Air Quality and Analysis Unit, Division of Air Pollution Control, Ohio Environmental Protection Agency, numerous substances are emitted into the air each year through human activities.

Those substances which are added to the ambient (outside) air in quantities sufficient to cause harmful effects on humans are considered pollutants. At present, there are six substances whose effects are known to be harmful at concentrations above the National Ambient Air Quality Standards as established by the U.S. Environmental Protection Agency. These six are Total Suspended Particles (TSP), Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Photochemical Oxidants (Ozone) and Lead. These substances are referred to as Criteria Pollutants, that is, substances for which air quality standards have been adopted by the U. S. Environmental Protection Agency. Air quality standards are also in effect for a seventh class of substances known as Nonmethane Hydrocarbons (NMHC). Though NMHC themselves are not considered harmful, guidelines have been established in an attempt to control their involvement in the formation of dangerous Photochemical Oxidants such as Ozone.

Air quality data collected during 1979 in the city of Lorain and Lorain County indicated violations of air quality standards for total suspended particles.

No official air pollution alerts were called in Ohio in 1980.

HUMAN ENVIRONMENT

Land Use - The banks of the Black River and the lakefront at the entrance to the harbor are characterized by high intensity industrial and related transportation uses, commercial docking facilities, utility uses, and recreation use activities. There remains, however, a significant amount of vacant or unused land available for industrial development along the 3-mile navigation channel.

The Port Authority of Lorain is the local agency responsible for promoting the industrial development of these waterfront properties. The Authority holds leases on various industrial properties that have been newly developed or expanded in recent years. The junction of the lake, river, and railroads has established the pattern of land use development for the remainder of the city of Lorain. In recent years, the City and local civic organizations, have embarked on an ambitious program of renewal and restoration that employs the beneficial aspects of the rail-river transportation network, while minimizing the barrier effect these networks have upon "free movement" within the City.

Coast Guard Station at Lorain - A U. S. Coast Guard Station is located on the east shore of the Black River at river mile 0.5. The station is continuously manned providing navigation regulation enforcement and surveillance, rescue and assistance operations for water craft, and maintenance of harbor navigational aids.

Cultural Resources - In order to assess the impacts of the proposed project on significant cultural resources, the 18 March 1980 edition of the National Register of Historic Places and all subsequent revisions were consulted. While several properties were listed for the city of Lorain, only one, the Lorain Lighthouse, is located close to the Environmental Impact Area of the proposed study. This structure would not sustain any direct impact

from construction of an improvement resulting from this study. Based on a cultural resources report completed for the area in 1975 entitled: Inventory of Cultural Resources: Diked Disposal Site No. 7, Lorain Harbor, Ohio, by Dr. Don Dragoo, and correspondence with Regional Archaeological Preservation Office, Cleveland, dated 14 July 1981, there are no potentially significant sites which would be impacted by any of the project alternatives. This report and correspondence are contained in The Cultural Resources Appendix (Appendix H).

Water Use: Commercial - Lorain Harbor is a deep draft commercial harbor serving the Port of Lorain which is almost exclusively a bulk cargo commercial port. Over the 10-year period 1969-1978, waterborne commerce at Lorain averaged 8,561,662 tons annually with peak volumes of 10,173,023 tons in 1972 and 11,584,368 tons in 1973. Waterborne commerce at Lorain in 1980 totaled 8,151,400 tons consisting principally of iron ore and concentrates and limestone.

While not extensively used as a commercial fishing harbor, it has been reported that five gill netters operate out of Lorain Harbor and that their average annual catch of fresh fish is between 150-200 tons.

Water Use: Recreational - The harbor includes two recreational boating marinas. One, owned by the City, is located between the Municipal Water Pollution Control Plant and the U. S. Coast Guard Station and has berthings for 70 boats. The other, privately owned, is located upriver adjacent to the Erie Sand and Gravel facility and below the N&W Railroad Bridge and has a berthing capacity of 23 boats. Due to the limited berthing capacity available at Lorain, trailering has been necessary.

The demand for recreational boating facilities is so great that the Lorain planning agencies, Lorain Port Authority, and private interests are seeking additional locations and financial aid to provide new facilities. A current plan of the City is to use the recently constructed diked disposal area as part of a large recreational-marina complex after the anticipated 10-year fill-in period. The harbor area immediately west of the disposal area could provide space for about 600-800 boats and additional boat-launching ramps, if developed. The Port Authority has constructed a temporary rubber-tire floating breakwater in the east basin of Lorain Harbor immediately west of the disposal area that will provide dockage for recreational craft until permanent small-boat facilities are constructed.

The Corps is considering five alternative plans of improvement for recreational craft in the east basin in response to the study authority stated in the Introduction section of this report. This is in keeping with the spirit of multiobjective planning.

Duck hunting from the breakwaters and sportfishing at most places accessible to the lake and harbor waters are popular recreation activities at Lorain. During the Initial Public Meeting, City officials expressed a desire for improved safe access to and along the breakwater for increased sportfishing opportunities. Lakeview Park, immediately west of Lorain Harbor, has 1,300 feet of lake frontage and is used by approximately a third of a million

people each summer. The city of Lorain considers the beach at Lakeshore Park to be a nucleus for future park development and growth.

Population - Lorain County experienced rapid growth between 1950 and 1960. In this period, the population grew from 148,200 to 217,500, a 47 percent increase. The rate of growth decreased to 18 percent, during the 1960's, an annual growth rate of 1.6 percent compared to the rate of 3.9 percent during the 1950's. The area experienced rising unemployment during the 1960's which slowed population growth. The era of rapid growth (i.e., the 1950's) was a time of industrial expansion in the area, and it is probable that future rapid increases in population will be contingent on increasing industrialization (Source: Northeast Ohio Demographic and Economic Projections 1970-2020). According to an advance report, 1980 Census of Population and Housing, U.S. Department of Commerce, Bureau of the Census, the 1980 population of Lorain County was 274,909. The population in 1970 was 256,843, representing a 7 percent change. Population projections for the Lorain-Elyria SMSA (Lorain County) for the years 1985-2030 are shown in Table 6.

The population of the city of Lorain has increased at a lower rate than that of Lorain County. During the 1960's, population of the city grew by 13 percent, compared with 18 percent for the county, which indicates suburban development in the region (Source: Northeast Ohio Demographic and Economic Projections 1970-2020). In 1980, the population of the city of Lorain was 75,416, a -3.5 percent change from the 1970 population of 78,185 (Advance Report, 1980 Census of Population and Housing, U.S. Department of Commerce, Bureau of the Census).

Employment and Income - Lorain County's employment population, conservatively estimated, is predicted to reach 125,902 in the year 2030 (Table 7) (Source: 1980 OBERS, BEA Regional Projections, U.S. Department of Commerce, Bureau of Economic Analysis). Mean family income figures for 1978 show Lorain County with an average of $19,409. This level is a bit above the State's 1978 average of $18,505 and is most likely a result of the urban-industrialized nature of the economy (Source: Draft Report, Preliminary Feasibility Report on Lorain Small-Boat Harbor, Lorain, OH, prepared for the Buffalo Engineer District by Tetra Tech, Inc.)

The Lorain Chamber of Commerce estimates 107,007 people were employed in Lorain County in 1981, with an average unemployment rate of 13.3 percent. In 1980, 110,338 people were employed on an average and the unemployment rate averaged 13 percent, while in 1979, 113,515 were employed and the unemployment rate was 7.4 percent.

Many industries, such as construction, manufacturing, transportation, and utilities, which had reached their peak of rapid growth in the 1950's, leveled out in the 1960's and are projecting little net growth between now and the year 2030. However, manufacturing will continue to be the dominant feature of Lorain's employment profile. While manufacturing is expected to stabilize through the year 2030, employment in the fields of services and Government is expected to increase by the year 2030 (Table 7) (Source: 1960 U.S. Census of Population; 1970-2020: Battelle projections, and 1980 OBERS, BEA Regional Projections: U.S. Department of Commerce, Bureau of Economic Analysis).

TABLE 6

Table 6—Population, Personal Income, and Labor and Proprietors' Income, 1969 and 1978, and Projected, 1985-2030

	Historical		No-change-in-share *				Low-change-in-share **				Moderate-change-in-share ***			
	1969[1]	1978[2]	1985	1990	2000	2030	1985	1990	2000	2030	1985	1990	2000	2030
Population (July 1)	254,074	271,210	277,421	283,135	298,861	308,015	286,654	295,079	303,687	323,384	289,820	300,972	313,860	337,736
							Thousands of 1972 dollars							
Total personal income (place of residence)	1,046,753	1,421,401	1,811,441	2,102,127	2,661,535	4,870,852	1,884,872	2,225,856	2,832,318	5,321,884	1,923,500	2,287,165	2,882,033	5,654,722
By place of work														
Total labor and proprietors' income[2]	804,308	1,088,867	1,410,198	1,838,202	2,072,425	3,847,544	1,476,305	1,738,251	2,216,125	4,124,137	1,498,936	1,784,884	2,318,382	4,386,804
Agricultural production	8,281	10,318	13,072	14,240	17,116	28,844	13,668	16,074	18,285	30,907	13,868	15,480	18,112	32,838
Nonfarm	796,027	1,088,538	1,397,127	1,623,962	2,055,309	3,818,999	1,462,637	1,721,178	2,197,840	4,093,230	1,485,068	1,768,385	2,300,280	4,354,066
Private	722,349	988,217	1,275,858	1,486,284	1,882,175	3,506,317	1,338,284	1,579,783	2,020,977	3,773,034	1,361,080	1,626,668	2,120,720	4,027,582
Agricultural services, forestry, fisheries, and other[3]	1,845	2,189	2,743	3,169	3,878	6,850	2,500	2,807	3,358	5,891	2,421	2,637	3,006	5,034
Mining	1,076	2,010	3,498	4,255	5,410	10,210	3,024	3,564	4,395	8,211	2,881	3,254	3,758	6,801
Construction	63,481	54,403	70,512	81,817	104,016	186,151	71,630	83,441	108,379	198,761	72,028	84,232	107,840	203,581
Manufacturing	428,220	613,782	777,871	884,906	1,112,068	2,011,262	828,568	966,866	1,217,150	2,209,159	843,275	1,002,584	1,292,231	2,397,161
Nondurable goods	40,848	46,120	56,607	64,507	79,213	141,338	57,828	66,266	81,703	145,970	58,213	67,043	83,236	149,633
Durable goods	387,380	567,663	721,264	830,399	1,033,455	1,869,825	768,740	900,601	1,135,447	2,063,190	785,061	935,542	1,208,995	2,247,528
Transportation and public utilities	30,837	52,403	68,514	81,077	108,303	208,214	76,721	93,666	125,706	248,104	79,577	100,137	140,472	288,914
Wholesale trade	17,680	27,198	35,070	40,192	50,062	90,596	36,071	41,638	52,129	94,494	38,406	42,304	53,433	97,598
Retail trade	75,253	86,225	111,947	128,491	159,399	297,064	114,071	131,598	163,871	295,483	114,763	133,045	166,848	302,809
Finance, insurance, and real estate	20,088	28,181	38,577	43,834	58,549	117,692	38,760	47,302	63,790	128,726	38,495	48,849	67,513	138,119
Services	84,081	119,646	168,956	207,422	281,892	578,276	168,918	208,903	264,199	593,204	170,212	209,525	285,519	586,758
Government	76,678	100,321	121,408	138,898	173,134	313,882	123,373	141,394	178,864	320,196	124,008	142,719	179,559	328,484
Federal civilian	18,891	23,921	28,234	31,327	37,565	64,055	30,613	34,736	42,357	72,624	31,417	36,436	45,882	81,071
Federal military	2,033	2,045	2,375	2,665	3,251	6,039	2,375	2,665	3,251	6,039	2,375	2,665	3,251	6,039
State and local	54,754	74,368	90,860	104,706	132,318	243,588	90,384	103,992	131,255	241,533	90,216	103,617	130,426	239,374

TABLE 7

Table 7—Employment by Industry by Place of Work, 1969 and 1978, and Projected, 1985-2030

[Total number of jobs]

	Historical		No-change-in-share *				Low-change-in-share **				Moderate-change-in-share ***			
	1969[1]	1978[1]	1985	1990	2000	2030	1985	1990	2000	2030	1985	1990	2000	2030
Total employment	80,319	106,141	117,733	122,242	125,490	125,802	121,757	127,540	131,743	132,356	123,136	130,154	136,188	138,399
Agricultural production	1,671	1,901	1,787	1,733	1,683	1,502	1,853	1,816	1,775	1,590	1,875	1,853	1,839	1,666
Nonfarm	88,648	104,240	115,946	120,508	123,807	124,399	119,904	125,726	129,968	130,768	121,281	128,301	134,350	136,733
Private	77,088	90,747	101,667	106,883	109,180	110,065	105,584	111,149	115,297	116,371	106,827	113,702	119,642	122,288
Agricultural services, forestry, fisheries, and other[3]	300	307	339	356	361	355	304	309	305	297	293	297	268	249
Mining	131	140	187	211	209	199	172	177	170	161	164	162	146	129
Construction	4,800	4,838	5,639	5,803	5,962	6,036	5,694	5,887	6,058	6,138	5,719	5,826	6,122	6,219
Manufacturing	37,523	40,907	44,077	44,885	44,749	43,163	46,677	48,282	48,696	47,147	47,576	49,973	51,529	50,916
Nondurable goods	4,306	4,394	4,635	4,702	4,706	4,549	4,718	4,808	4,829	4,672	4,744	4,853	4,800	4,764
Durable goods	33,217	36,513	39,441	40,184	40,044	38,615	41,959	43,474	43,868	42,476	42,832	45,120	46,629	46,152
Transportation and public utilities	2,876	3,943	4,288	4,418	4,578	4,851	4,770	5,092	5,399	5,526	4,845	5,438	6,022	6,419
Wholesale trade	1,818	2,174	2,456	2,543	2,610	2,622	2,513	2,619	2,700	2,716	2,533	2,654	2,754	2,786
Retail trade	13,918	17,171	19,629	20,876	21,436	21,531	20,008	21,185	22,051	22,174	20,131	21,422	22,459	22,734
Finance, insurance, and real estate	2,361	3,402	4,175	4,475	4,797	5,163	4,417	4,807	5,212	5,631	4,498	4,960	5,506	6,071
Services	13,562	17,676	20,966	22,815	24,488	26,335	21,028	22,792	24,706	26,581	21,068	22,968	24,834	26,764
Government	11,550	13,493	14,278	14,526	14,816	14,345	14,320	14,576	14,670	14,398	14,333	14,589	14,707	14,445
Federal civilian	1,201	1,317	1,324	1,313	1,288	1,242	1,437	1,458	1,454	1,410	1,475	1,530	1,576	1,575
Federal military	1,248	956	951	951	951	951	951	951	951	951	951	951	951	951
State and local	9,101	11,221	12,003	12,261	12,377	12,152	11,932	12,167	12,265	12,037	11,907	12,116	12,180	11,919

* In the no-change-in-share procedure, for each industry, the substate area's share of the State's employment was held constant throughout the projections period. A substate area's projected share of total (all-industry) State employment, therefore, will change only to the extent that the substate area has a disproportionate share of the State's fast- or slow-growth industries.

** In the low-change-in-share procedure, for each industry, the substate area's share of the State's employment was projected to change from 1978 to 1980 at an annual rate of change equal to 75 percent of the annual rate of change in the share from 1969 to 1978; from 1980 to 1985, at an annual rate equal to 1/2 of the projected annual rate for 1978-80; and for each succeeding 5-year period, at 1/2 of the projected rate for the preceding 5-year period.

*** In the moderate-change-in-share procedure, for each industry, the substate area's share of the State's employment was projected to change from 1978 to 1980 at an annual rate of change equal to 85 percent of the annual rate of change in the share from 1969 to 1978; from 1980 to 1985, at an annual rate equal to 2/3's of the projected annual rate for 1978-80; and for each succeeding 5-year period, at 2/3's of the projected rate for the preceding 5-year period.

1. In each procedure, for the Federal military, the 1978 level of employment in each substate area was held constant to 2030.

2. For cases of z... employment in 1969 and positive employment in 1978, the no-change-in-share procedure was applied.

3. It should be noted that these projections do not reflect the Census Bureau's 1980 population count, which is being tabulated as this report is written. It is anticipated that the final census count for the Nation as a whole will exceed the count implicit in the national population projections used in this report by about five million persons. Currently, it is not possible to determine the implications of this shift for the OBERS results. However, a study to determine the implications will be undertaken.

SOURCE: 1980 OBERS, Bea Regional Projections: US Department of Commerce, Bureau of Economic Annlysis

Business and Industry - Manufacturing plays a major role in the local economy and in 1978, 40,997 people or 38.6 percent of the labor force was employed by the 55 diversified manufacturing industries in the area (Table 7). The 10 largest firms, located along the banks of the Black River in the immediate project area, provide employment for 12,300 people. Employment figures for the top five firms in the harbor area are shown in Table 8. Other firms with less than 100 employees include Allied Oil Co., and Erie Sand and Gravel Co.; and Lorain-Elyria Sand Co.

Table 8 - Major Employers at Lorain Harbor (1974)

Company	Employment Estimate
U. S. Steel Corporation	10,000
American Ship Building Co.	1,000
Griffith and Sons, Inc.	500
National Gypsum Corporation	300
Falbo Construction, Inc.	100

SOURCE: Personal communication, John Sulpizio, Director, Lorain Port Authority, Lorain, Ohio.

Local Development - The Lorain Port Authority was created in 1964, to facilitate growth within the harbor area and has financed a $7,000,000 dry-dock modification and related improvements for American Ship Building Co. through an industrial revenue bond issue. Their participation in a $5,000,000 terminal project for Allied Oil Company has also added to transportation resources within the harbor.

In May of 1980, Republic Steel Corporation completed construction of a large iron ore transshipment dock adjacent to the outer harbor. The principal function of the terminal is transshipment of iron ore pellets to Cleveland Harbor, OH, and to inland steel plants. The facility is capable of accommodating 1,000-foot self-unloading bulk vessels, and expects to transship about 7.5 million tons of iron ore per year in the next few years. This facility has played a major role in the recent increase in annual waterborne commerce at Lorain.

In addition to industrial expansion and improvement, Lorain has realized the importance of redevelopment in the downtown area and has begun an urban renewal project in a 17-acre site surrounding Lorain's new City Hall. Major retail, commercial, and housing facilities are included, along with a parking structure and civic center for its citizens. A large urban renewal project in south Lorain is another example of redevelopment in the downtown area including residential redevelopment and commercial expansion.

These projects have the cooperation of the Community Development Department which is working toward improving movement of traffic by synchronizing traffic lights and the potential development of a mass transportation system. The City is also considering beach improvements to the east of the harbor area at Century Beach.

Transportation Facilities and Services - Lorain, OH, is served by three trunkline railroads. The Baltimore and Ohio Railroad (B&O) runs directly from the Port of Lorain into southern Ohio and western Pennsylvania. The Norfolk and Western Railroad (N&W) provides east-west service connecting with Cleveland and points east, as well as Chicago and St. Louis to the west. The third railroad serving Lorain is the Conrail Corporation.

The city of Lorain has east-west transportation via highway, U. S. Route 6, and south on State Routes 57 and 58. The Lorain-Elyria metropolitan area is served by Interstates 90 and 80, connecting between Toledo and Cleveland. Interstate 71, which provides access to the north and south, is about 15 miles east of Lorain-Elyria.

The Lorain City Airport, formerly located in the southwest quadrant of the intersection of State Routes 611 and 58, has been moved to the Lorain County Airport approximately 8 miles south of the City. The county airport can accommodate smaller commercial aircraft; however, no commercial airlines utilize this facility on a regularly scheduled basis.

Cleveland Hopkins International Airport, located less than 20 miles to the east of Lorain in the city of Cleveland, is the principal commercial airport facility servicing the area.

Docks and Terminal Facilities - There are 18 wharves and docks within the Federal project limits at the Port of Lorain, OH. One is located adjacent to the Outer Harbor, six are situated on the west bank, and 11 on the last bank of the Black River within the city of Lorain. Table 9 summarizes the commercial dock facilities at Lorain Harbor. The principal commodities handled at these terminals, in terms of annual tonnage shown in Table 10, are iron ore pellets, limestone, and sand and gravel.

Bridges - There are three bridges which cross the Black River within the limits of the Federal navigation channel. The Erie Avenue Bridge, constructed in the late 1930's, has a total length of about 1,050 feet and consists of a twin-leaf bascule main span with eight steel-girder approach spans on the west and one approach span on the east. The structure carries two, 22-foot roadways separated by a 3-foot median and two, 7-foot wide sidewalks. The main span is 295 feet long and provides approximately 147.5 feet horizontal clearance, with 33.5 feet of vertical clearance above mean water elevation at the bridge center when in the closed position. The Norfolk and Western vertical lift railroad bridge provides an understructure clearance of 123'-8" and channel width of 205 feet. It was reconstructed in the 1940's as part of the Federal project. The 21st Street Bridge, constructed in the 1940's, is a six span 1,700-foot through truss with a 400-foot river crossing span. The understructure clearance, based on Lake Erie Low Water Datum of 568.6 feet, is 99.6 feet for approximately 250 feet

Table 9 - Commercial Dock Data - Lorain Harbor

Dock Name and Location	Material Handled	Operator	Dock-side Equipment	Loading Capacity Tons/Hr	Dock Length Ft.	Depth at Dock Ft.	Storage Capacity Tons	Land Service
Republic Steel Corp. Lorain Pellet Terminal Mooring Basin Outer Harbor	Mooring Vessels	Republic Steel Corporation			1,095	25		Rail, Veh.
Republic Steel Corp. Lorain Pellet Terminal Wharf below Erie Ave. Bridge Left Bank	Ore Unloading	Republic Steel Corporation	Transshipment Facility	2,500 Rail 5,000 Ship	1,200	27	532,000	Rail, Veh.
Lorain Works Hd. Black River	Ore Unloading	U.S. Steel Corporation	3-20T Hullets	4,800	2,490	26	3,000,000	Rail, Veh.
Erie Sand, Ft. E. 9th St.	Unloading Sand and Gravel	Erie Sand and Gravel Co.	Self-Unloaders Only	-	460	19	65,000	Veh.
Griffith, Dock No. 1, Upper Turning Basin	Unloading Gravel, Sand	Griffith Blacktop Inc.	Self-Unloaders Only	-	400	27	75,000	Veh.
Lorain Slag, above 21st St. Bridge	Unloading Slag, Dry Bulk Materials	U.S. Steel Corporation	Self-Unloaders Only	-	220	20	18,000 Slag 12,000 Coke	Rail, Veh.
Gold Bond Building Products Above 21st St. Bridge East Bank	Unloading Gypsum	National Gypsum Co.	Self-Unloaders Only	100	750	20	120,000	Rail, Veh.
Adams, above N & W R.R. Br.	Unloading Sand Stone & Gravel	North Ridge Trucking Inc.	Self-Unloaders Only	-	300	27	22,000	Veh., Rail
Terminal Ready Mix, above N&WRR Br.	Unloading Sand & Stone	Terminal Ready-Mix, Inc.	Self-Unloaders Only	450	500	24	30,000 Stone 20,000 Sand	Veh.
Allied, above 21st St. Bridge	Unloading #2 Fuel Oil	Allied Oil Co. Div. Ashland Oil	16" Pipeline	-	185	23	500,000 Bls.	Veh.
Am. Ship Bldg. Boiler Stop Dock below N&WRR Br.	Build & Maintain Vessels	American Ship Building Co.	-	-	900	18-25	-	Rail, Veh.
Republic Steel Corp. Mooring Wharf, between 14th and 15th St.	Mooring Vessels During Closed Navigation Season	Republic Steel Corporation	-	-	880	24	-	Veh.
Griffith Dock No 2, below 21st St. Bridge	Unloading Sand Pig Iron, and Steel Products	Griffith Blacktop Incorporated	One 150-T Crawler Crane	-	200	27	120,000	Veh.
American Ship Bldg. Pipe Shop Dock below N&WRR Br.	Mooring Vessels for Repair	American Ship Building Company	-	-	325	18-24	-	Rail, Veh.
American Ship Bldg. North Wharf, above Erie Ave. Br.	Mooring Vessels for Outfitting and Repair	American Ship Building Company	-	-	535	18-27	-	Rail, Veh.
Reagan Marine Supply Wharf, above Erie Ave. Bridge	Mooring Vessels	Reagan Marine Supply	-	-	78	8-10	-	Veh.
Corps of Engrs. Dredge Pumpout Facility Mooring below Erie Ave. Bridge	Mooring Dredge for Pipeline Discharge of Dredged Material to Spoil Area	U. S. Army Corps of Engineers	Two 16-inch Pipelines	-	200	27	-	Veh.
U. S. Coast Guard Lorain Station Slip	Mooring U. S. Coast Guard Vessels	U. S. Coast Guard	-	-	92	0-9	-	Veh.

Source: United States Ports on Lake Erie, Port Series No. 42 Revised 1980, Corps of Engineers, U. S. Army

in the center river crossing span. Piers are twin reinforced concrete columns on piling with a reinforced concrete strut connection near the top. The five piers range in height from 43 feet to 79 feet. The roadway is 42 feet curb to curb and there is a 7-foot sidewalk on the west side.

Historical Tonnage - There are many active docks within the Federal project limits. Two iron ore receiving docks and the U. S. Steel Corporation limestone dock account for the majority of domestic bulk receipts in recent years. Several other smaller docks that receive refined petroleum products, gypsum rock, sand and gravel, and stone products account for the remainder of the annual traffic tonnage. These tonages are displayed in Table 10.

Table 10 - Historical Tonnage of Major Bulk Commodities
Lorain Harbor, OH

Year	Iron Ore	Limestone	Sand and Gravel	Gypsum Ore	Coal	All Others
1966	3,529,042	709,865	513,579	94,508	1,636,170	137,819
1967	2,998,893	458,603	525,060	150,869	1,387,883	32,130
1968	4,026,139	768,858	513,850	94,964	5,146,995	73,878
1969	4,420,521	729,719	504,016	131,385	3,303,811	23,368
1970	3,421,070	1,255,077	582,014	125,616	3,127,335	61,986
1971	3,238,738	1,235,734	442,116	120,879	2,407,446	38,876
1972	4,214,292	1,372,711	410,929	168,627	3,933,568	72,896
1973	5,626,470	1,738,988	410,183	172,472	3,569,843	66,412 (1)
1974	4,709,615	1,599,868	503,533	120,614	2,033,309	109,951 (1)
1975	4,337,928	1,379,981	402,071	111,816	1,268,731	149,814 (1)
1976	4,557,441	1,277,691	285,672	146,612	1,061,407	110,290 (1)
1977	3,085,136	1,235,005	485,971	112,786	1,262,936	105,079 (1)
1978	5,580,150	1,113,080	409,278	186,860	815,546	131,350 (1)
1979	2,998,923	1,177,687	366,051	197,969	0	92,381

(1) Increase since 1973 is attributed to petroleum receipts at Allied Oil Terminal.

SOURCE: Waterborne Commerce of the United States, Part 3, Great Lakes, Corps of Engineers.

Table 11 - Historical Iron Ore Fleets (2)

Vessel Size	Period of Analysis							
	1979	1978	1977	1976	1975	1974	1973	1972
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Class III (500 to 549 feet)	0	0	0	1	0	0.5	(1)	1
Class IV (550 to 599 feet)	0	1	0	0	0	0.5	(1)	2
Class V (600 to 649 feet)	100	81	85	97	87	94	86	88
Class VI (650 to 699 feet)	0	10	5	2	10	2	5	2
Class VII (700 to 730 feet)	0	1	5	0	2	1	(1)	3
Class VIII (731 to 849 feet)	0	7	5	0	1	2	8	4
Total Domestic Traffic	2,980,223	5,223,904	2,413,721	4,130,128	4,223,464	4,637,571	5,479,991	4,088,498

(1) Less than 0.5 percent.

(2) Average for all docks receiving iron ore.

SOURCE: Unpublished Statistics from Waterborne Commerce of the United States, Corps of Engineers.

Historical Fleets - Iron Ore - Historical data on fleets used to ship iron ore from other U.S. harbors to Lorain, OH, are shown in Table 11. This fleet summary excludes Canadian iron ore receipts. However, receipts of Canadian ore have averaged only 215,000 tons per year during the interval 1968 through 1977, about 5 percent of the total ore receipts, and does not significantly distort average fleet characteristics.

U.S. Steel Corporation operates its own Great Lakes fleet that has a fleet capacity to move most of its annual limestone requirements from Port Dolomite and Calcite, MI, to its upriver steel plant.

Historical Fleets - Limestone - Limestone traffic is presently carried in self-unloading bulk vessels to docks along the Black River. The U. S. Steel Corporation dock at the upper end of the project handles most of the annual limestone receipts. Therefore, the composition of the historical limestone fleet serving this harbor has been heavily influenced by the vessel types and sizes in the U. S. Steel Corporation's Great Lakes self-unloaidng fleet. The distribution of vessels and their sizes used at Lorain Harbor between 1972 and 1976 is shown in Table 12.

NATURAL ENVIRONMENT

Biological Environment - This section presents a brief summary of the biological environments and common fish and wildlife species present in the Lorain Harbor study area. The information presented here has been summarized from that provided in the U. S. Fish and Wildlife Service Intermediate Fish and Wildlife Coordination Act Report for commercial navigation dated 22 January 1981 (Appendix F), and for the 19 February 1982 Intermediate Coordination Act Report for recreational navigation (Appendix C of Volume 2). The Fish and Wildlife Service conducted a four-season biological survey of the Lorain Harbor Study area from October 1978 to October 1979. In addition, other data was gathered from literature searches and contacts with professionals with knowledge of the biological environment of Lorain Harbor area. The U. S. Fish and Wildlife Service study area included the outer harbor, the lower Black River, and riparian areas to 3 miles upstream of the upper turning basin.

Habitat - The total water surface area of the Lorain Outer Harbor, exclusive of the lake approach channel, is approximately 180 acres. Approximately 80 acres of this area is presently dredged for commercial navigation. Approximately 70 acres of undredged bottom habitat remains on the east side of the harbor and approximately 30 acres remain on the west side. The east side of the harbor is bounded by the east rubblemound breakwater (2,020 feet) and the east sheet steel breakwater shorearm (2,323 feet). Lakeward of the outer harbor is the outer sheet steel breakwater (2,180 feet) with riprap toe protection. The shoreline parallel to Lakeside Avenue is a moderately-sloping substrate of gravel and cobble. A portion of the east side of the Lorain Sewage Treatment Plant pier is protected with large riprap. The west side of the harbor is bounded by a rubblemound breakwater (4,000 feet). The majority of the undredged western portion of the harbor is shallow with a substrate of sand.

Table 12 - Historical Limestone Fleet Summary

Vessel Size	1979	1978	1977	1976	1975	1974	1973	1972
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Class IV (500 to 599 feet)	55	34	32	19	19	6	28	19
Class V (600 to 649 feet)	37	48	40	43	45	56	72	79
Class VI (650 to 699 feet)	5	18	21	26	24	32	0	0
Class VII (700 to 730 feet)	3	0	5	12	12	5	0	0
Class VIII (731 to 849 feet)	-	-	2	-	-	-	-	-
Total Domestic Traffic (1)	1,177,687	1,133,080	1,235,005	1,277,691	1,379,981	1,599,868	1,738,988	1,372,711

(1) Tonnage statistics represent vessel movements to all limestone docks.

SOURCE: Unpublished Statistics from Waterborne Commerce of the United States, Corps of Engineers.

The inner harbor consists of the lower 3 miles of the Black River which is dredged to a depth of 27 feet (LWD) for commercial navigation. Only narrow strips of shallow water habitat remain on either side of the commercial channel in this area. The river is bulkheaded with sheet steel from the mouth to the Erie Avenue Bridge, along the American Shipbuilding Company property, and along the south side of the upper turning basin. Most of the rest of the shoreline of the inner harbor consists of steep eroding banks with some outcroppings of shale. The only area with a rather gently-sloping shoreline is the wetland area immediately below and downstream of the 21st Street Bridge. This wetland is approximately 15 acres in size and is vegetatively dominated by broad-leaved cattails and other emergent plants. Water quality in the lower reaches of the Black River is severely degraded and sediments from both the inner harbor and Outer Harbor are polluted. The combination of lack of available habitat and poor sediment and water quality severely limit the establishment of high quality habitats and species associations in the study area.

Fishery Resource - A moderately-diverse fish community persists in Lorain Harbor in spite of rather limited physical habitat and degraded water quality. Within the last 10 years, 47 species of fish have been identified in the Outer Harbor. During the same period of time, 41 species of fish have been collected within the lower reaches of the Black River. Gizzard shad and emerald shiner dominate catches in both the outer harbor and the lower river area. Freshwater drum, smelt, white bass, spottail shiner, trout-perch, and yellow perch are also common in the Outer Harbor. Trout-perch are also very common in the lower river along with carp, brown bullhead, and white sucker. Sport fishing is almost completely confined to the outer harbor area. The most common game fish caught are yellow perch, smallmouth bass, and channel catfish. Spawning and nursery habitat for fish are almost nonexistent in the lower river area and in the outer harbor the habitat is severely limited because of deep navigation channel depths.

Wildlife Resources - Wildlife observed was concentrated in the 21st Street wetland and the river area upstream of the upper turning basin. The persistent emergent cover in the wetland provides shelter for small mammals such as eastern cottontail, shrews, mice, and voles. Numerous muskrat and raccoon tracks were observed during late fall in the areas where broad-leaved emergents are withered and matted in mud flats. A snapping turtle was also observed in the wetland.

Birds - Lorain Harbor is located on the eastern edge of the Mississippi flyway and on the western edge of the Atlantic flyway, thus attracting large numbers of ducks, geese, and swans which pass through the area on migratory flights between southern wintering grounds and northern breeding grounds. The outer harbor provides good feeding habitat for many species of diving ducks including mergansers and scaup. These ducks are primarily attracted to the abundant food source of gizzard shad and emerald shiners. The only abundant dabbling duck is the mallard. Herring gulls, ring-billed gulls, and Boneparte's gulls are also attracted to the Outer Harbor. The gulls generally outnumber all other water birds in the harbor area. No significant amounts of waterfowl breeding occur in either the Outer Harbor or the lower reaches of the Black River.

Federally Endangered and Threatened Species - The proposed project lies within the range of the following Federal endangered (E), threatened (T), or proposed (P) species: Indiana bat (E) (Myotis sodalis). This area was inspected by a biologist of the U.S. Fish and Wildlife Service and it was determined that no suitable habitat for endangered species existed. Therefore, the project, as currently proposed, will not jeopardize the continued existence of any Federally listed species.

PROBLEMS, NEEDS AND OPPORTUNITIES

This subsection of the report describes the harbor and the activities within the limit of the navigation project. It then defines current commercial navigation problems and needs at Lorain. This section also discusses pertinent future developments which may affect navigation and summarizes the improvements desired by local interests.

Other problems and needs at Lorain Harbor deal with harbor maintenance operations, sedimentation and small-boating activities. These are being considered and addressed as separate volumes of the Lorain Harbor Study.

The Present Harbor

Use - The present harbor is used both by commercial and recreational vessels. The commercial vessels trade primarily in bulk iron ore pellets and limestone. Republic Steel recently obtained ownership of the lakefront coal dock, and has converted this coal dock to an iron ore pellet transshipment facility. Shipments of coal from this facility has been terminated after the 1978 navigation season. Iron ore is now delivered to both the new lakefront transshipment facility and upriver to the U.S. Steel docks. Large quantities of limestone are also delivered to various docks along the channel. Recreational boating facilities are all presently located along the river.

There is also an active shipyard located at Lorain. This shipyard has launched at least three of the "super jumbo" (1,000-foot) vessels and is one of only two active shipyards on the American side of the Great Lakes with a dry dock of sufficient size to accommodate construction and maintenance for this size ship.

Physical Properties - The harbor consists of a breakwater protected lakefront harbor in Lake Erie and an improved navigation channel on the Black River which extends 3 miles upstream from the mouth. The harbor is Federally improved and is shown on Plate 1. The improved lakefront harbor encompasses an area of about 60 acres and extends for a distance of approximately 1 mile into Lake Erie from the mouth of the Black River.

Four breakwaters and two piers comprise the protective system at Lorain; the outer breakwater, east breakwater, east breakwater shorearm, west breakwater, west breakwater shorearm and the East and West Pier. The Outer Breakwater and the East Breakwater Shorearm were constructed using steel sheet pile cells filled with granular fill and topped with a 2-foot thick concrete cap. The East Breakwater and West Breakwater are constructed of a quarry chip core, an underlayer of stone (averaging 2 ton) and a laid up armor stone

cover layer (minimum 3 tons). The West Breakwater Shorearm is of rubblemound construction with an underlayer of stone (500 pound minimum with not more than 50 percent less than 2 ton) and an armor layer (minimum 2 tons). All authorized Federal navigation improvements to the lakefront harbor are completed. Authorized depths throughout the Federal project limits are listed below:

29 feet in lake approach channel;

28 feet in 800-foot wide channel through the Outer Harbor;

25 feet in remainder of Outer Harbor except the 16-foot deep area in the west Outer Harbor in the channel to the municipal pier;

28 feet in completed portion of the lower 2,200 feet of the river channel,

27 feet in the remainder of the river channel, except in the vicinity of the Norfolk and Western Railroad bridge and at cut number 1 to within 500 feet of the upstream project limit and 24 feet in the remainder;

17 and 21 feet in the upstream turning basin; and,

20 feet in the downstream turning basin.

Uncompleted authorized improvements to the Black River consist primarily of improvements in the area on the west bank just upstream of the Erie Avenue Bridge known as Cut Number 1 (Plate 1). Those incomplete improvements consist of bank stabilization and dredging and were authorized by the 1960 and 1965 Rivers and Harbors Acts. The authorized river channels were designed to provide safe and efficient operation of 730-foot (i.e. Seaway size) vessels operating at a maximum draft of 25.5 feet (LWD).

Harbor Maintenance Operations - The Corps of Engineers is responsible for repairing the breakwaters and for dredging the general navigation river channels and lakefront harbor channels to authorized depths. Corps of Engineers derrick boats are currently used to maintain the breakwaters. Repairs to the East and West Breakwater include periodic rearrangement of the existing armor stone and additions of new armor or core stone where required. The Corps of Engineers maintains authorized depths within the Federal project limits. This work is performed either by Corps hopper type dredge or private Contractors under contract to the Corps. This dredging is normally performed during a 2 to 4-week period between April and June. Polluted material dredged since 1978 has been deposited in a confined disposal area adjacent to the East Breakwater Shorearm.

Improvements Desired by Local Interests - As part of the problem identification process, the District conducted a series of workshops and public meetings and has received correspondence from affected local interests. This input was utilized to identify the major problems which exist at Lorain Harbor and in the development of alternative plans of improvement commercial

navigation. A summary of these initial meetings and correspondence is presented below:

Correspondence - On 4 March 1970, the Lorain Port Authority requested the Buffalo District to make a technical review of the Federal project at Lorain Harbor to determine if the new 1,000-foot vessels being built at that time could be accommodated within the authorized channels. The District responded on 13 March 1970 stating that ". . . Although it would be physically possible for vessels up to 1,000 feet long and 105 feet wide to navigate the Black River channel with the use of tugs and thrusters, it would be inadvisable. Extreme care would have to be exercised and vessel speed reduced to a minimum which would make the vessel vulnerable to sudden gusts of wind or changes in river currents and could cause the vessel to ground or strike shore facilities."

Following the technical response noted above, a series of meetings were held by the Lorain Port Authority to map a course of further action for improvements at Lorain Harbor. The existing Erie Avenue Bridge was subsequently identified as the major problem for the shipyard and the upriver iron ore dock operated by U.S. Steel. U.S. Steel Corporation publicly announced on 7 July 1976, a planned facility expansion at Lorain. The result of the meetings and public announcement was a resolution by the Port Authority, supported by the City Council that was sent to Congressman Charles A. Mosher. The resolution requested that the U.S. House of Representatives Public Works and Transportation Committee authorize the Corps of Engineers to determine whether any modification of the existing project is necessary to accommodate the passage and safe navigation of new and larger ships operating on the Great Lakes. This authorization was adopted by the U.S. House of Representatives Committee on Public Works and Transportation on 23 September 1976.

On 17 August 1981, the General Manager of U.S.S. Great Lakes Fleet Service, Inc. provided comments on the Preliminary Feasibility Report on Lorain Harbor completed by the Corps in October 1980 (revised May 1981) and data on anticipated vessel sizes to be used in the Lorain Upriver Trade. He anticipates that vessels up to 767 feet X 72 feet will be the largest vessels used by U.S. Steel and suggested that the Riverside Park Cut, discussed at a workshop with local interests on 4 February 1981, be considered to eliminate congestion (vessel delay) and that three bends in Black River be modified to allow more efficient operation of 767-foot X 72-foot vessels on the Black River.

Meetings - On 27 April 1978 an Orientation Workshop was held in the Council Chambers at the Lorain City Hall. The commercial interests expressed concerns dealing with navigation safety and channel efficiency. The major concerns identified were: (1) the constricted Outer Harbor entrance; (2) the channel alignment through the Erie Avenue Bascule Bridge; (3) the clearance under the 21st Street Bridge; (4) restrictive width of the existing channel, which allowed one-way movement of traffic except in the turning basins; (5) and increased evidence of bank erosion and dock damage, both attributed to movement of Great Lakes vessels equipped with bow and stern thrusters.

Turbulence generated by these thrusters has been correlated to increased streambank erosion at or near bends in the river channel.

Other interests expressed a need and desire for additional recreational boating and fishing facilities and the elimination of vehicular traffic delays caused by the increased frequency for opening of the Erie Avenue Bridge. The local officials concurred with these needs and with the concerns expressed by the commercial interests.

At the Initial Public Meeting held on 31 May 1978, the commercial navigation interests reiterated their needs and concerns as expressed at the earlier Orientation Workshop meeting. Interested citizens and local officials restated their desires for expanded recreation boating and fishing facilities. The U.S. Fish and Wildlife Service stated their opposition to any project work which would diminish or adversely alter any existing marsh or wetland areas thereby adversely impacting wildlife habitat.

Based on these initial meetings and communications, the improvements desired by local interests are summarized as follows:

a. Improvements to the lakefront harbor entrance to permit safe navigation of the harbor for the new larger vessels,

b. Improvements to the Erie Avenue Bridge to permit launching of 1000-foot vessels from American Ship Building Co. without the use of tugs.

c. Improvements to the Black River channel for safe navigation and to accommodate larger vessels or lakefront construction of a transshipment facility with alternative modes of transportation (conveyor, special purpose vessel, rail or truck) for the upriver movement of ore and stone which will permit the utilization of larger more economical vessels at Lorain Harbor.

d. Adequate provision for future protected small-boat berthing facilities and consideration of the use of the protected harbor area by recreational craft.

e. Improvement in water quality in the Black River.

Commercial Navigation Problems and Needs - There are both commercial and recreational navigation problems at Lorain. This volume as part of the overall Lorain Harbor Study will primarily address improvement alternatives for commercial navigation as related to the newer, larger class of bulk carriers and will discuss recreational navigation only as impacted upon by commercial navigation. Specific problem identification and improvements for recreational boating has been evaluated by the District and the results are presented as a separate volume to the Lorain Harbor Study.

The fundamental commercial navigation problems are to move bulk cargos more economically through Lorain Harbor and to permit safe and efficient passage of vessels into the harbor and upriver to both American Ship Building and U.S. Steel facilities. Bulk cargo tonnages at the Republic Steel and U.S. Steel docks may increase as both companies respond to the long-term demand

for steel products required by the national economy. Republic, in 1981, handled in excess of 5 million tons of iron ore, the majority of this volume was delivered in Class X vessels, and used to service Cleveland area mills and inland areas in Pennsylvania and Ohio. U.S. Steel, at the time of the development of preliminary plans, stated an interest in taking advantage of the economies of maximum size vessels at Lorain Harbor, OH. Harbor modifications are also beneficial to American Ship Building Co., which can construct maximum size vessels. More vessels will be built and launched from the Lorain facility in the future. Vessel movements to the shipyard will also be supplemented by an increasing number of hull inspections to comply with Coast Guard requirements. Vessel inspections every 5 years are a mandated activity by the U.S. Department of Transportation which requires dry docking of a vessel for several days.

If the harbor and river were modified to prevent delays or permit operation of vessels loaded to maximum system draft, annual transportation savings are in the order of millions of dollars. A discussion of needed improvement follows.

Design Vessel Size - The Maximum Ship Size Study prepared by North Central Division, Corps of Engineers, evaluated the future needs for Class X and larger vessels on the Great Lakes for the project period. This study ultimately concluded that the Class X will be the maximum size vessel using the Great Lakes for the foreseeable future, and that future demand for larger vessels could range from 30 to 40 additional Class X vessels by the year 2045 (see Table 13). Since the American Ship Building Corporation facility upstream of the Erie Avenue Bridge, is one of only two locations within the Great Lakes that can accommodate Class X vessels, it is reasonable to assume that the Lorain facility will actively participate in the construction and inspection of these ships during the project evaluation period.

Table 13 - Construction Schedule for Maximum Size Vessels in the GL/SLS System

Interval	New Vessel Launchings	Interval	New Vessel Launchings
1995 - 2000	7	2020 - 2025	4
2000 - 2005	4	2025 - 2030	4
2005 - 2010	5	2030 - 2035	2
2010 - 2015	3	2035 - 2040	1
2015 - 2020	2	2040 - 2045	4

SOURCE: Maximum Ship Size Study, North Central Division, Corps of Engineers, 1977.

Design Vessel Drafts and Required Channel Depths - This section will address the criteria and assumptions for the detailed design channel entrance into Lorain Harbor for bulk cargo vessels up to 1,000 feet in length. The entrance plan is designed to create a safe navigation entrance channel from Lake Erie into the Port of Lorain.

Adequate channel depths and widths are required for safe and efficient navigation of ships. Therefore, at an 8 April 1981 workshop in Cleveland, vessel masters were requested to provide their professional and expert views on 1,000-foot long vessel operating characteristics that are required for the design of an "all-weather west entrance at Cleveland Harbor. According to the vessel masters, when entering Cleveland Harbor under design "all-weather" conditions (i.e., 9-foot waves and 30-knot winds), a 1,000-foot long vessel would have to be traveling at a speed of approximately 6 miles per hour in order to maintain proper vessel control. Once in the protected entrance channel, the vessel would slow down to 2 to 3 miles per hour before turning into the Lakefront Harbor. When entering at a speed of 6 miles per hour under the design conditions, an angle of roll of 3 to 5 degrees can be expected on a 1,000-foot long vessel. The vessel masters also indicated the angle of roll for smaller vessels would be about 1-1/2 times the angle of roll of a 1,000-foot long vessel, or between 5 and 7 degrees. The vessel masters also stated that they need sufficient water under their vessel in order to be able to use their engines without rupturing oil and air lines due to excessive vibration of the vessel. These vessel operating characteristics were assumed to be applicable to vessels entering the entrance to Lorain Harbor. In April 1983, the District conducted model tests at the Waterways Experiment Station (WES) in order to investigate the degree of roll, 1,000-foot vessels would experience during design storm conditions and to access the effects of various underkeel clearances in ship maneuverability. A dynamically balanced scale model 1,000-foot ore carrier was subjected to various broadside wind and wave conditions. The results from these tests indicated that the 4-degree allowance for vessel roll, as previously estimated by the vessel masters, is considered adequate during the design storm conditions. The results from turning tests verified the need for 2-foot underkeel clearance to compute channel depth. A detailed discussion of these model tests is contained in the DESIGN APPENDIX - Appendix C.

Channel Depth - The channel depth requirements will include consideration of the following significant criteria:

a. The static draft of the vessel at rest;

b. The sinkage or squat of the vessel underway;

c. The amount of vessel roll;

d. The effect of vessel pitch and heave; and

e. Nominal bottom clearance.

The channel depths were selected to safely and efficiently accommodate the passage of the design vessel which is normally the largest vessel (length, beam, and draft) expected to use the channel during the project life. At

Lorain Harbor, the largest vessel expected to utilize the harbor is a Class 10 (1,000 feet X 105 feet) bulk cargo vessel. The numerical calculations of the required depths were developed from practical and theoretical information in technical reports and papers. The calculations are based on a 25.5-foot design system draft. The following paragraphs discuss the significant criteria which were considered in determining the required channel depths. The results of the channel depth evaluation are summarized in Table 14. The depth requirements include the greater of the values for either vessel roll or the combination of pitch and heave.

(1) Vessel Squat - Vessel squat is the lowering of the water surface around a moving vessel which produces a relative change in the ship's position with respect to the channel bottom. Vessel squat was calculated on the basis of procedures outlined in Chapter 9 of the draft Engineer Manual (EM 1110-2-xxxx) entitled "Deep Draft Navigation Project Design" dated December 1979, also by an empirical method recommended in the "Study Report of Vessel Clearance Criteria for the Great Lakes Connecting Channels" prepared by Detroit District, Corps of Engineers using the following formula:

$$S = \frac{V_i^2}{2g} \quad \frac{1.01\ A_i^2}{A_w} \quad - 0.84$$

Where: S = Squat at speed V_i (feet).
V_i = Ship velocity (feet/second) relative to water.
A_i = Channel cross-sectional area (square feet).
A_w = Channel cross-sectional area less ship cross-sectional area (square feet).
g = 32.2 feet/second.

Pertinent parameters include: static draft of 25.5 feet, vessel beam widths, entrance speed at 6 mph, reduced speed of 3 mph in the Outer Harbor channel and 2 mph in the river channel, waterway width, and channel depth (assumed).

(2) Vessel Roll - Vessel roll is rotation of a vessel around its longitudinal axis as a result of waves, wind, and turn angle. Roll is greatest when the vessel hull is parallel to the wave crests. According to vessel masters, an angle of roll in the entrance channels of between 3 and 5 degrees can be expected on the Class 10 vessel. Model tests at WES verified that 4-degrees of roll is valid. This analysis will use an angle of 4 degrees of roll for the Class 10 vessel. Vessels would not experience any roll once they get into the Outer Harbor channel. The following formula is used to compute vessel rolls

$$Y - \frac{B}{2} \sin 0$$

Where: Y = Depth requirement due to roll (feet)
B = Vessel beam
0 Angle of roll in degrees

The computed roll values in the entrance channels were 3.7 feet for the 1,000-foot long vessel.

(3) Vessel Pitch and Heave - Vessel pitch is rotation of a vessel about its transverse axis and heave is the vertical body motion of a vessel.

These motions are caused by waves and are greatest when a vessel hull is normal to wave crests. The equations presented in the "Study Report of Vessel Clearance Criteria for the Great Lakes Connecting Channels" prepared by Detroit District of the Corps of Engineers were used to compute the depth requirement due to pitch and heave. These equations are as follows:

$$\frac{\theta L}{2} - 0.1\ H$$

and

$$\frac{\text{Heave}}{H} = 0.1$$

Where: $\frac{\theta L}{2}$ = Pitch amplitude in feet

H = Wave amplitude in feet

The pitch and heave value in the Lake Approach Channel was determined to be 0.8 feet for each class vessel. Pitch and heave will not be experienced by any class of vessel in the Outer Harbor channels. However, the maximum values of roll, or pitch and heave are not additive since their occurrence is a funciton of hull and wave crest orientation (i.e., if the vessel hull is parallel to the wave crest, roll is maximum and pitch and heave approach zero). Therefore, the larger of the values or roll, or pitch and heave are used in determining the required channel depth. For entrance plans at Lorain, the depth requirements for roll govern over the values for pitch and heave.

(4) Nominal Bottom Clearance - After all depth requirements are made for vessel squat, roll, and pitch and heave, it is desirable to design for additional bottom clearance for vessel safety and efficiency. The commom allowances for bottom clearance are 2 feet in soft material and 3 feet in hard material. All material at Lorain is considered to be soft and, therefore, a nomimal bottom clearance value of 2 feet is included in the channel depth requirement.

The maximum allowable drafts for 1,000-foot vessels operating in the existing Lorain Harbor are summarized in Table 14, following. It should be noted that these results are based on depths as measured from Low Water Datum on Lake Erie. Using the values calculated based on the design criteria, Class X vessels can safely and efficiently operate in the Lake Approach Channel at a draft of only 23.0 feet, 2.5 feet less than system draft of 25.5 feet.

Conversely, the Lake Approach Channel would have to be deepened from its existing 29 feet below LWD to 31.6 feet (say 32 feet) below LWD to permit entry by 1,000-foot vessels for the design condition. However, once the ship enters the harbor channel and the river approach channel, it would decrease

speed and would also experience negligible pitch or roll due to the protection afforded by the existing breakwaters. Therefore, there is presently enough depth in the harbor channel and the river approach channel to allow operation of Class X vessels with no further deepening. In summary, the base-case vessel (the longest vessel that can operate under present conditions) for the Outer Harbor will be a Class X (1,000 X 105) when operating under design conditions.

Table 14 - Allowable Draft Calculations in Existing Harbor for 1,000-Foot Vessels at Low Water Datum (LWD)

Lake Approach Channel	
Authorized Depth Below Low Water Datum	29.0 feet
Squat at 6 mph	0.4 feet
4° roll	3.7 feet
Pitch and Heave	0.8 feet (1)
Bottom Clearance	2.0 feet
Draft Allowed	22.9 feet
Additional Draft Required (Required Depth Below LWD)	25.5-22.9 = 2.6 feet, say 3 feet (25.5 feet draft + 0.4 feet squat + 3.7 feet roll + 2.0 feet clearance = 31.6 feet, say 32 feet
Outer Harbor Channel	
Authorized Depth Below Low Water Datum	28.0 feet
Squat at 3 mph	0.1 feet
0° roll	0.0 feet
Pitch and Heave	0.0 feet
Bottom Clearance	2.0 feet
Draft Allowed (Approximate)	25.9 feet
Additional Draft Required	0.0 feet
River Approach Channel	
Authorized Depth Below Low Water Datum	28.0 feet
Squat at 2 mph	0.4 feet
0° roll	0.0 feet
Pitch and Heave	0.0 feet
Bottom Clearance	2.0 feet
Draft Allowed (Approximate)	25.6 feet
Additional Draft Required	0.0 feet

(1) Not included in calculation of depth because roll values predominate.

Breakwater Modifications - All commodities received at or shipped from Lorain Harbor must pass through the breakwater protected Outer Harbor. A new lakefront facility constructed by Republic Steel became operational in May

1980. This facility is slated to handle in excess of 6,000,000 tons annually to be transhipped either by rail inland or by vessel to Cleveland, OH, steel plants on the Cuyahoga River. This dock has been and will continue to receive 1,000-foot vessels on a regular basis (see Photos 1 and 2). The existing 525-foot width of the Outer Harbor entrance makes operation of maximum size vessels difficult except in good weather conditions.

Discussions conducted with vessel masters during the development of required harbor modifications revealed the limiting conditions of the existing breakwater configuration for Class 10 vessels. The existing Outer Harbor entrance is protected by a 2,180-foot detached breakwater lying in an east-west direction. This Outer Breakwater affords protection from northerly winds. However, its location exposes the harbor entrance to southwesterly and westerly storms. According to the vessel masters storms and winds from these directions act against the large surface area of the vessel hull and super structure and create formidable navigation problems as they turn broadside into these winds and waves to enter the Outer Harbor. Under these existing breakwater conditions the masters of 1,000-foot vessels would attempt entry with their ship only under good weather conditions (winds under 25 mph). Utilizing the wind and wave conditions assumed to design the channel depth for an "all-weather" entrance (9-foot waves and 30 knot winds), it is also considered necessary to investigate modifications to the existing breakwaters to provide adequate channel width for an "all-weather" harbor. An entrance configuration very similar to that currently existing at Lorain Harbor was model tested at the Waterways Experiment Station (WES) during the Cleveland Harbor Study. Tests at WES indicated that this entrance may not be totally satisfactory when winds are from a northerly direction (the most adverse wind condition for Lorain). In this instance, the extra force that the wind exerts on the vessels stern cabin tended to turn the vessel in a counterclockwise direction, which was opposite to the turn they were trying to make. In several test runs with a scale model of a 1,000-foot ore carrier, this caused the vessel to strike a breakwater. In the Cleveland Harbor model, the channel width between the breakwaters ranged from 600 to 1,200 feet, far in excess of the 550-foot currently existing between the East and West Breakwaters at the Lorain Harbor.

Two alternative modifications were considered that would alleviate this problem: (1) swing 500 feet of the West Breakwater out, to the west; or (2) remove 600 feet of the western end of the East Breakwater and lengthen the eastern end of the Outer Breakwater by 600 feet. Either alternative would have the same effect: widen the channel entrance from 550 feet to 900 feet at its narrowest point. This 900-foot width would provide the additional width for vessel manuevering when entering under adverse weather conditions. This additional width would also increase the margin of safety against potential vessel damage by the vessel striking a breakwater.

The second alternative was selected as the preferred alternative for a number of reasons. Swinging a portion of the West Breakwater out would leave more of the Inner Harbor unprotected from the open lake. Moving the West Breakwater would also require relocation or demolition of the West Breakwater Lighthouse, a structure listed as a National Historic Landmark. Modifications to the East and Outer Breakwaters could provide the same entrance width without any of the anticipated negative effects.

Photo 1. 1,000-foot Mesabi Miner entering Outer Harbor. July 1980.

Photo 2. 1,000-foot Mesabi Miner unloading at Lorain Pellet Terminal. July 1980.

In summary, the fundamental needs related to the lakefront harbor are modifications to the breakwaters and/or dredging to greater depths.

As part of this Final Feasibility Report, a Diffraction Analysis was conducted to determine the change in wave heights at various inner harbor locations due to the proposed modifications to the Outer and East Breakwaters (see Appendix C). This analysis concluded that these breakwater modifications would not have a major affect on the wave climate inside the harbor. However, it is the District's opinion that a model study should be conducted on Lorain Harbor to accurately determine the effects that the proposed breakwater modifications would have on both commercial navigation in the harbor and also how it would affect the wave climate in the east harbor basin at the location of the proposed small-boat harbor.

Base-Case Conditions for Black River - Approximately 4.8 million net tons of cargo were shipped to docks along the Black River in 1979. The majority of this commerce was iron ore and limestone destined for the U.S. Steel plant located at the upper limit of the Federal project. Other bulk commodities transported on the Black River were gypsum, limestone, petroleum products, sand, gravel, and crushed stone.

The bulk of this material was moved in Class V and VI vessels. However, a portion of the upriver limestone delivered to U.S. Steel was transported by Class VII vessels. Vessel characteristics of the Great Lakes fleet types are shown below in Table 15.

Table 15 - Physical Characteristics of the Great Lakes Fleet

	Representative Vessel Characteristics				
Vessel Class	Overall Length (Feet)	Length (Feet)	Maximum Operating Draft	Trip Capacity (Gross Tons)	Capacity Per Inch of Draft (Short Ton) ($ Millions) (June 1981)
5	600 to 649	625	25'7"	20,150	107
6	650 to 699	700	26'4"	23,200	124
7	700 to 730	730	27'4"	26,850	130
8	731 to 849	806	28'6"	32,000	167
9	850 to 949	858	27'10"	44,500	201
10	950 to 1,099	1,000	27'10"	59,000	257

SOURCE: Maritime Administration, U.S. Department of Transportation, letters dated 14 December 1979 and 25 June 1981.

Modifications are necessary to the Black River channel and to bridges crossing the river for larger vessels to safely and efficiently navigate to

Photo 3. Erie Avenue Bridge looking downstream. July 1980.

Photo 4. Launching of 1,000-foot J. R. Barker at Lorain Harbor. Erie Avenue Bridge being opened. (Photo courtesy of Elyria Chronical Telegram.) November 1976.

LAUNCHING OF THE EDGAR SPEER - CLASS X VESSEL
August 15, 1980

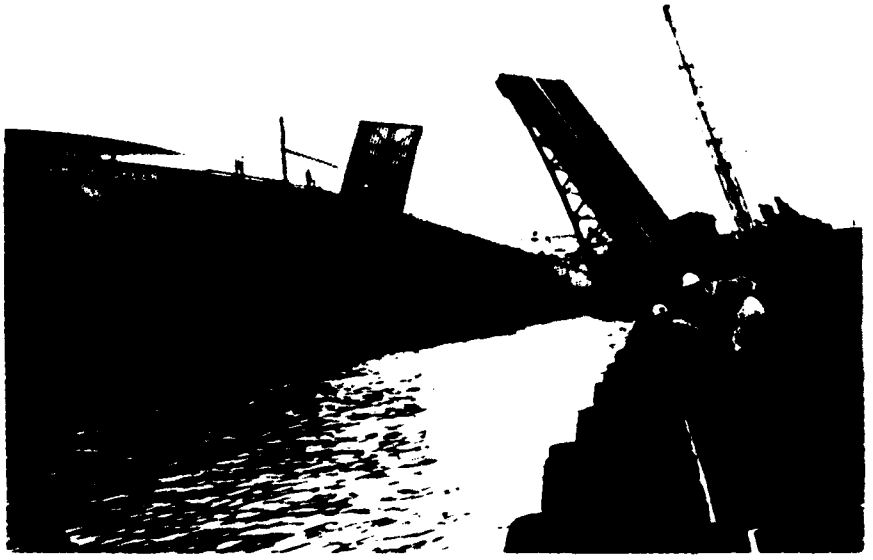


Photo 5

Note lack of clearance between the ship and the bridge.

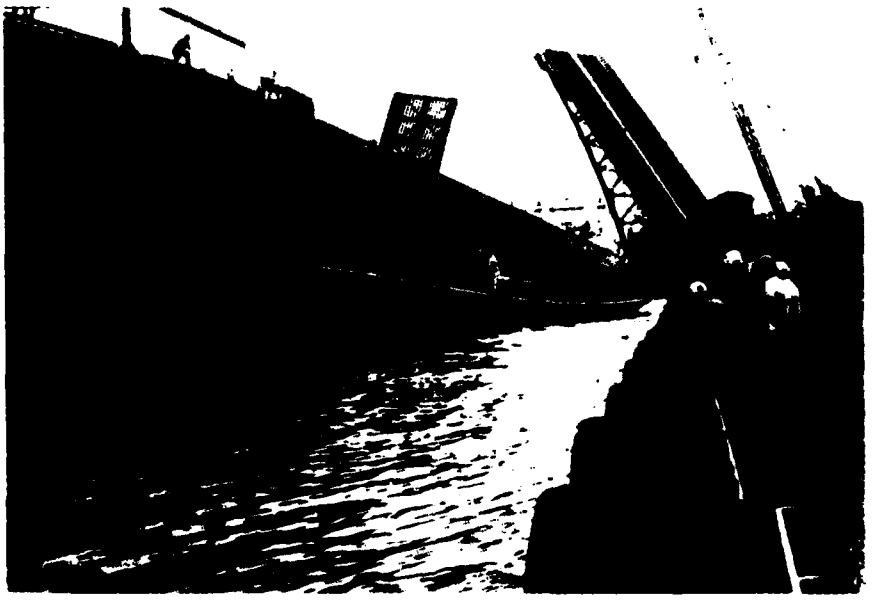


Photo 6

the upper limit of the Federal project. The major areas of needed improvements to allow these vessels to navigate the river are outlined below.

a. Erie Avenue Bridge - The Erie Avenue Bridge, built in the late 1930's, is located approximately 1/2-mile upstream from the mouth of the Black River. The existing structure has a total length of about 1,050 feet and consists of a twin-leaf bascule main span with eight steel girder approach spans on the west and one on the east. The main span is 295 feet long and provides approximately 147.5 feet horizontal clearance when open (see photo 3). Because this bridge is at an angle to the river and because it is necessary to turn a vessel immediately after passing through the bridge when upbound, it has not been possible for Class X vessels to safely transit this bridge without tug assistance. Three Class X vessels have passed through the bridge opening to date. All three were constructed at the AmShip facility and were launched and guided through the bridge opening with the aid of six tugs one or more times (see photos 3-6).

Coast Guard regulations requiring that the ship's bridge extend to the edge of the vessel makes passage even more difficult. When the Erie Avenue Bridge is fully open the leaves are still not perpendicular to the water surface. Thus, unlimited vertical clearance is not available over the full width of the channel through the draw and there is limited room for clearance of the wider ship's bridge, with only unlimited clearance available at midship while the bridge is in the open position. Therefore, modifications must be made to the Erie Avenue Bridge to allow free and easy passage of any vessels larger than Class VII without tug assistance or else the channel upstream and downstream of the bridge must be realigned.

There are presently two users upstream of the Erie Avenue Bridge, the AmShip facility and the U.S. Steel works, who would benefit from modifications to the channel to allow safe and efficient passage of Class X vessels.

The U.S. Steel Lorain-Cuyahoga Works is located at the upstream limit of the Federal project approximately 3 miles from the mouth of the Black River. This company is one of the few domestic steel producers which owns and operates a captive Great Lakes fleet. Historically, iron ore has been delivered to this facility in Class V and VI vessels which comprise a large percentage of the U.S. Steel fleet. Even though predominantly Class V and VI vessels have been utilized, Class VII self-unloading vessels have also navigated the river to the U.S. Steel facility. U.S. Steel has begun updating their fleet with the purchase of Class X vessels to compensate for the annual transport capacity lost due to vessels scrapped or otherwise removed from service. At a public meeting conducted for preliminary planning, U.S. Steel expressed a desire to utilize Class X vessels for direct delivery of ore to the Lorain facility in conjunction with a future dock expansion program.

Recent correspondence with U.S. Steel has indicated that their current plans call for the use of Class VIII, self-unloading vessels which are 767 feet by 72 feet in size. These vessels, although larger than the design standard for Lorain, have been able to enter the existing harbor, but at restricted drafts.

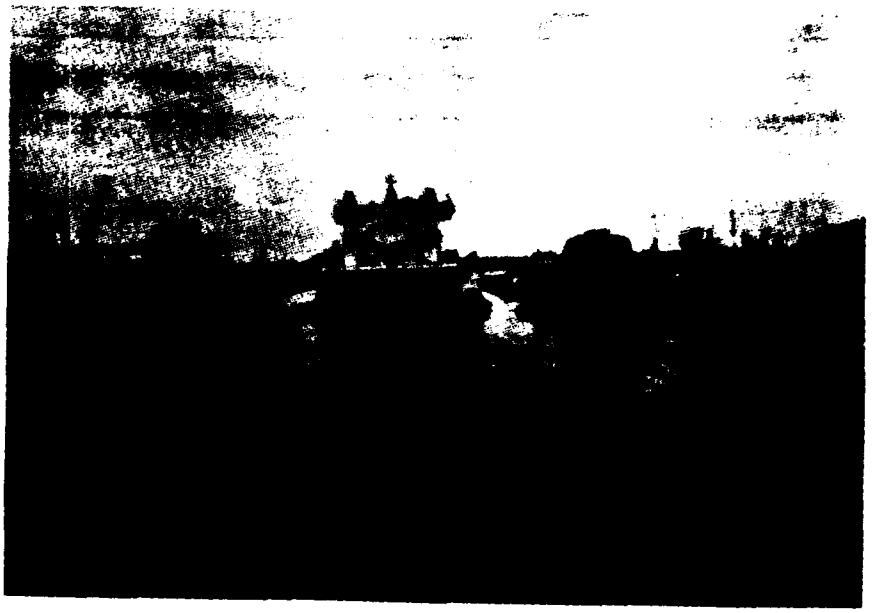


Photo 7. Launching of the EDGAR SPEER (August 15, 1980) (Note amount of available river width occupied by the vessel).

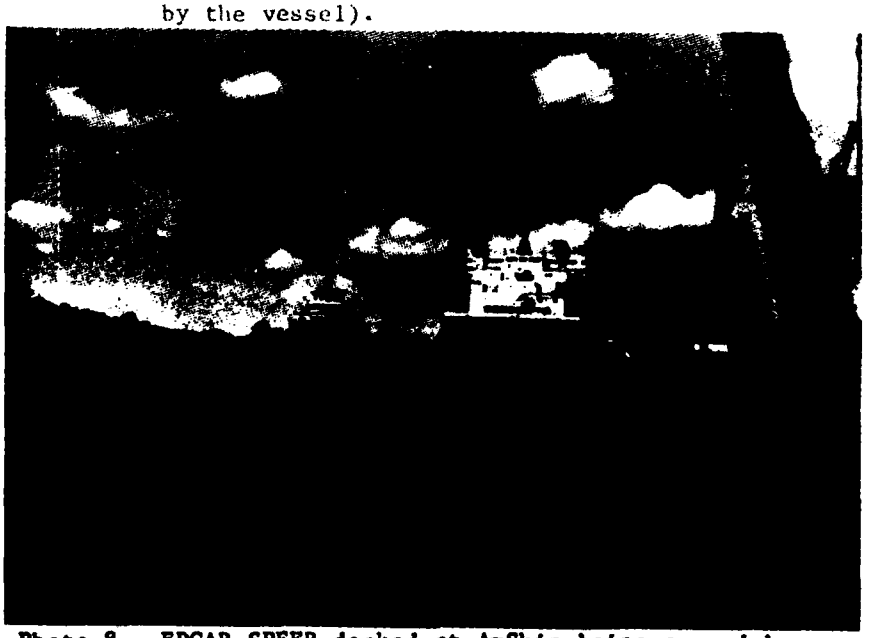


Photo 8. EDGAR SPEER docked at AmShip being passed by a 630-foot vessel. (Note constricted channel.) July 1980.

b. Channel Modifications on Black River - The Black River Channel contains a number of curves in the 3-mile reach to the head of commercial navigation. Channel modifications on the Black River would be necessary if vessels larger than the design seaway class vessel (730 feet) operating on the Great Lakes are to navigate the river (see photos 7 and 8). Such modifications would include major channel widening due to the increased length and width of these larger than seaway class vessels. However, the extremely good maneuverability and design of these vessels with twin screws and bow and stern thrusters will help reduce the extent of future channel widenings. The channel modifications may be separated into two basic categories: (1) channel widening and (2) erosion protection for channel banks.

Required channel widths are comprised of a maneuvering lane width, a width for bank clearance on each side of the maneuvering lane, and additional widening for bends. The maneuvering lane width is required for the vessel to maneuver without encroaching on the safe bank clearance. The width for bank clearance is necessary to reduce the bank suction force between the vessel and the channel banks. Also, due to the waves created by the design vessels with bow and stern thrusters, bank protection should be considered in the critical areas subject to these waves and their velocities.

c. 21st Street Bridge - The existing 21st Street Bridge is a six-span 1,700-foot through truss with a 400-foot river crossing span (see photo 9). The superstructure clearance, based on a Lake Erie Low Water Datum of 568.6 feet, is 98.7 feet for 256 feet in the center river crossing span. Piers are twin reinforced concrete columns on piling with a reinforced concrete strut connection near the top. The five piers range in height from 43 feet to 79 feet. The roadway is 42 feet curb to curb and there is a 7-foot sidewalk on the west side. The roadway width is inadequate by today's standards. Plans were approved in 1939 from which it is concluded the structure is in the order of 37 to 39 years old.

A Class X vessel, 950 to 1,000 feet in length, requires a superstructure clearance of 125 feet above the river's surface. The existing clearance of 98.7 feet would therefore prevent passage of Class X vessels under the bridge without a major modification or replacement of the bridge or ships impact.

River Congestion Problem - Whenever a large vessel is unloading at the Republic Steel dock on the west bank near the mouth of the Black River, it encroaches into the Federal navigation channel. Berthing of the shuttle vessel, which operates between Lorain and Cleveland Harbors, at its dock immediately downstream of the Erie Avenue Bridge also creates some delays to other vessels on the river. The captains of vessels bound for the U.S. Steel facility believe that there is not enough channel width available for safe passage when a vessel is at the Republic Steel dock and have asked these docked vessels to be moved to allow passage to upriver docks. This operating procedure was utilized for several months during the 1980 navigation season, but proved to be both time-consuming and costly to the affected vessels. On this basis, an analysis was performed to determine at the economic viability of river modifications to eliminate this congestion point. The results of this analysis are presented in Appendix B.

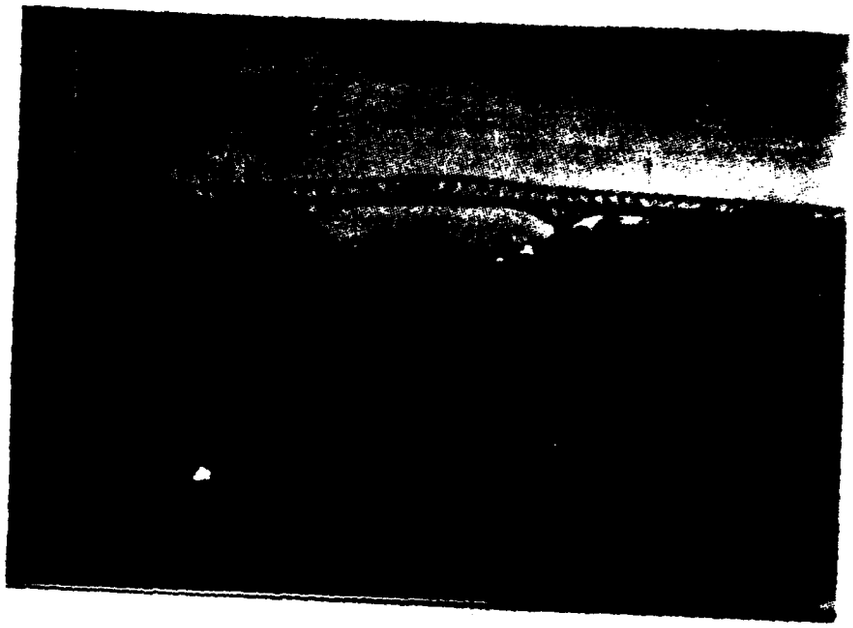


Photo 9. 21st Street Bridge looking downstream. Petroleum unloading facility on the east bank. July 1980.

Fish and Wildlife Resources - The U.S. Fish and Wildlife Service, in their reports (Appendix F), have indicated that there is a scarcity of suitable, shallow water habitat in the Outer Harbor area at Lorain. In addition the lower 3 miles of the Inner Harbor, which comprises the Federal channels on the Black River are severely limited in biological productivity due to dredging, steep banks, and riprapped shorelines. Poor water and sediment quality in both the Inner and Outer Harbor areas further limit the productivity of the areas.

The Outer Harbor comprises an area of about 180 acres, of which about 80 acres is dredged to deep depths for commercial navigation purposes. About 70 acres on the east side and 30 acres on the west side of the Outer Harbor area remain undredged. The concern of the Fish and Wildlife Service is that further dredging in the Outer Harbor area, for commercial navigation purposes, will decrease the total amount of habitat available for fish spawning, nursery, and feeding areas.

Another biological habitat concern expressed by the U. S. Fish and Wildlife Service relates to the Inner Harbor area along the lower 3 miles of the Black River. Throughout this area much of the river has been dredged to 27 feet below LWD. Only narrow strips of shallow water aquatic habitat exist throughout most of this area. The only area of real biological significance is a wetland, about 15 acres in size, located below and immediately downstream of the 21s. Street Bridge. The Fish and Wildlife Service has expressed concern that this wetland area be protected from any future dredging or filling activities.

The final area is of biological habitat concern expressed by the Fish and Wildlife Service, riparian areas of the Black River upstream of the Upper Turning Basin. This area consists primarily of low shoreline with steeply eroding bluffs. Most of the area near the U. S. Steel Plant consists of a high steep berm set back only a short distance from the river shoreline. The opposite river bank and a midriver island is undeveloped, consisting of intermittently flooded woodlands. Several areas of marsh and shrub swamp are interspersed throughout the area. The Fish and Wildlife Service has expressed concern that these areas might be impacted by future pressures for commercial development in relationship to navigation improvements of the harbor.

Opportunities for Enhancement and Preservation - A number of possible fish and wildlife resource enhancement and preservation possibilities exist at Lorain Harbor and have been suggested by the U. S. Fish and Wildlife Service. Improved shallow water habitat could be provided in the Outer Harbor by placing riprap (stone) in shallow water areas to provide more attractive spawning and nursery habitat. Such rubblemound when placed within 10 feet of the water surface to form "reefs" often attracts large number of fish and is usually a high quality productive habitat for fish food organisms.

Protection of the 21st Street Wetland and other upstream wetlands along the Black River could take the form of outright purchase or by obtaining permanent restrictive easements on the area for wildlife purposes. The 21st Street wetland could be increased in size by adding clean dredged material to

the wetland. Water quality in the wetland could be improved by relocating two storm sewer discharge pipes that currently discharge runoff waters directly into the area. In areas where new bank cuts occur, and bulkheading is not needed, bank cuts could be gently sloped and covered with riprap in shallow water areas to improve aquatic habitat.

Fish and Wildlife Resource Mitigation - Mitigation involves avoiding an impact, minimizing its severity, rectifying the impact, or compensating for the impact by uplacing or providing substitute resources for the predicted impact. In order to provide mitigation it must be proven that the impact is occurrring to a significant resource. Fish and Wildlife Resources mitigation, if determined necessary, could take similar forms as discussed previously under enhancement. These include but are not limited to, creation of aquatic habitat "reefs" of stone; preservation methods for wetlands, and construction of certain parts of the project to enhance aquatic habitat. The U.S. Fish and Wildlife Service, in their 7 March 1983, draft Coordination Act Report have suggested mitigation for two of the detailed plans presented in this report. Further discussion of possible mitigation is presented in the COMPARISON OF DETAILED PLANS Section of this report.

Recreational Boating Needs - At the Initial Public Meeting held on 31 May 1978, local interests expressed their desires for additional facilities to accommodate small-boat operators at Lorain. They stated that there is presently an unfulfilled demand for additional permanent mooring facilities in the area and for additional public launching facilities. The recreational boating needs at Lorain Harbor are addressed in Volume 2 of this report.

Recreational Fishing Needs - Although recreational fishing improvements have not been specifically requested during the public involvement process, consideration was given to such improvements in this study. The potential for shore-based recreational fishing from the breakwaters, piers, and other Federal structures at Lorain is addressed in Volume 2 of this report.

Reduction of Maintenance Dredging - The Federal project at Lorain Harbor is dredged periodically by Corps of Engineers hopper type dredges and by private contractors under contract to the Corps. Historical quantities removed during these operations are summarized in Table 4 for the period 1967 through 1981. The average annual volume dredged has been approximately 154,000 cubic yards and is normally performed during a 2-to 4-week period between April and June. Occasionally, dredging operations have extended into November. Beginning in 1978, maintenance dredging material has been deposited in a confined dike disposal area adjacent to the East Breakwater Shorearm. This structure has an estimated capacity equivalent to 10 years of normal maintenance dredging operations at Lorain Harbor. This design standard is based on the assumption that after 10 years, water treatment plants along the river, will improve the quality of existing bottom sediments and implementation of conservation measures within the basin will reduce the quantity of sediments within Federal channels and permit the resumption of open-lake and/or shore area dumping.

Based on the "Sediment and Erosion Study" that was performed by Buffalo District as part of the overall Lorain Harbor Study, the major source of the sediment dredged at Lorain Harbor is from erosion of upland areas in the

Black River watershed, which accounts for about 70 percent of the total streambank erosion along the Black River and its tributaries contributes about 10 percent and the remaining 20 percent is contributed by local industries, treatment plants and runoff from streets in Lorain. Volume 3 of this report addresses the erosion and sediment problem and the maintenance dredging need at Lorain Harbor.

NATIONAL OBJECTIVES

The national objectives are set forth in the Water Resources Council's "Principles and Standards for Planning Water and Related Land Resources." The two national objectives are to enhance National Economic Development (NED) by increasing the value of the nation's output of goods and services and improving the value of the nation's output of goods and services and improving national economic efficiency, and to enhance the environmental quality (EQ) by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

PLANNING OBJECTIVES

The principal planning objective of this volume of the Lorain Harbor Study is to determine the nature, extent, and feasibility of improvements for commercial navigation at Lorain Harbor. The goal of this report is to select the best plan of action, limited action, or no action after considering measures to provide:

a. Safe and efficient commercial navigation to and from the harbor channels, with the emphasis on modifications to the existing harbor to accommodate larger vessels up to 1,000-foot in length now operating on the Great Lakes.

b. Protection and improvement of existing biological habitats along the lower reach of the Black River and the outer harbor area. These areas include 100 acres of shallow, undredged habitat in the outer harbor; unimproved shoreline along the Black River; wetland, about 15 acres in size, near the 21st Street Bridge, and undeveloped riparian areas upstream of the upper turning basin.

CONDITIONS IF NO FEDERAL ACTION TAKEN (WITHOUT CONDITION PROFILE)

Lorain Harbor received approximately 8,151,400 tons of cargo in 1980. All of the dock operators, except for three, are not experiencing any difficulty operating within existing Federal harbor project dimensions. These dock operators were asked about future requirements and responded that there was no need for improvements in the immediate future. These docks are serviced by much smaller vessels than those at the iron ore and limestone docks.

The three dock operators who could benefit from improvements to the harbor and river channel are: Republic Steel, American Shipbuilding, and United States Steel. Republic Steel and American Shipbuilding have accommodated Class X vessels and U.S. Steel has expressed interest in receiving iron ore

in Class X vessels to their Lorain facility. Upriver receipts of limestone and iron ore are based upon vessel maximum size of 767 feet X 72 feet and with draft restrictions.

Republic Steel - Republic Steel began operations in Lorain in 1980 at the newly constructed Lorain Pellet Terminal which is located on the west bank of the Black River near the mouth. This facility has the capability of transshipping iron ore by either rail or vessel and handled 3,000,000 tons of iron ore in 1980. Predictions by Republic are that between 6,000,000 and 7,000,000 tons will be handled annually with approximately 3,000,000 tons being transshipped inland by rail to Ohio and Pennsylvania and the remainder moving by water to the Republic docks on the Cuyahoga River in Cleveland. Based on information provided by Republic Steel officials, the annual design capacity of this facility is approximately 8 million tons.

Most iron ore destined for the Republic dock at Lorain will be received in Class X vessels. It is anticipated that to efficiently use this facility, two Class X vessels will be utilized full-time, other smaller vessels part-time, and a Class V vessel full-time to shuttle ore from Lorain to Cleveland.

Republic is now using maximum size vessels in the Outer Harbor and expects to continue such use in the Outer Harbor area even with restricted drafts during periods of low lake levels and possible difficulty in docking or unloading during storm weather conditions.

Class X vessels were able to enter the harbor at static drafts of about 26.0 feet during the 1980 shipping season by utilizing the current high lake levels on Lake Erie. Over time, however, Lake Erie will return to levels closer to Low Water Datum and result in the vessels destined for the Republic Steel transshipment terminal to be less than fully drafted. Low lake levels can be expected to increase the extent of light-loading of vessels entering the harbor because of the existing 29-foot depth constraint at the entrance. A fully loaded Class X vessel can deliver approximately 3,000,000 tons to Lorain during a 275-day navigation season. Therefore, two Class X vessels could handle almost all of the Republic future tonnage projections at Lorain with occasional deliveries from other vessels. Reductions in the trip capacity of Class X vessels will increase the number of deliveries required by other vessels and increase total transportation costs. Therefore, improvements to allow Class X vessels to enter the harbor fully loaded at all times would maximize the benefits of using these large vessels.

American Ship Building Company - The Lorain shipyard is located on the east bank of the Black River about 1 mile upstream from the mouth. It has two dry docks, one of which can accommodate vessels up to 1,000 feet long. The other dry dock is presently being renovated to accommodate vessels up to 767 feet long. This facility, one of only two shipyards on the Great Lakes capable of drydocking maximum size vessels, launched their first Class X vessel, the JAMES R. BARKER, in 1977. Since that time, two other Class X vessels have been constructed and launched, the MESABI MINER in 1977 and the EDGAR SPEER in 1980 (see photos 5-8). The Lorain AmShip facility is also

involved in the construction of smaller vessels, repairs and modifications to existing vessels, and inspections of existing vessels.

A recent study by the North Central Division Corps of Engineers, (Maximum Ship Size Study, December 1977), estimated that the projected level of bulk tonnage in 2045 will require a fleet of between 30 and 40 vessels of Class X size and it is quite probable that AmShip will continue to be involved in the construction of Class X vessels in the future.

Coast Guard regulation Title 46, CFR, Part 91 "Inspection and Certification" (Sept 77; Coast Guard rules and regulations for cargo and miscellaneous vessels, U.S. DOT), requires that all Great Lakes vessels be drydocked at least every 5 years for a hull inspection. Because of the large drydock available at Lorain, the AmShip facility will play an important role in these hull inspections. Since this drydock is also used in construction of Class X vessels, scheduling problems may result.

Even if no Federal action is taken, AmShip would continue to be an active productive shipyard. However, movements of the Class X vessels into and out of the dry docks now require tug assistance. This assistance cannot be avoided unless bridge and/or channel modifications on the Black River are implemented.

U.S. Steel Corporation - The U.S. Steel Lorain-Cuyahoga Works is located at the upstream limit of the Federal project approximately 3 miles above the mouth of the Black River. Approximately 3,000,000 tons of iron ore are delivered to their dock annually and in 1980, about 3,500,000 tons of ore were handled. This company announced plans in 1976 to expand their steel plant and increase raw material receipts to approximately 5,000,000 tons annually. Company officials stated that this growth would be facilitated by improvements to allow Class X vessels to transit the Black River.

U.S. Steel historically operated a fleet of vessels consisting primarily of Class V and VI vessels. These vessels are approaching the end of their design life and will need to be replaced in the foreseeable future. The Hulett ore unloaders used at the Lorain dock to unload bulk freighters are also nearing the end of their useful life. Self-unloading vessels have been making the slower and more labor-intensive Hulett unloaders obsolete and most new Great Lakes vessels are constructed as self-unloaders. Conversion of existing ships to self-unloaders is also increasing.

Whether improvements are made to the Federal project or not, U.S. Steel is not expected to rely upon the present methods of raw materials handling. Since the Hulett unloaders and the Class V and VI vessels are becoming outdated, there are two alternate methods that they might utilize. The first would be continued direct delivery by self-unloading vessels of the largest size capable of navigating the Black River. U.S. Steel has recently stated that in the future iron ore will be moved to the Lorain plant in Class VIII vessels (Appendix D for correspondence). These Class VIII vessels are 767 feet long by 72 feet wide and have been converted to self-unloaders. This vessel can presently negotiate the Black River channel. But, because of

channel restrictions at some of the bends, these vessels must now be light loaded to prevent grounding in the Black River channel. An alternative for U.S. Steel would be to use Class X vessels for delivery to the lakefront harbor and then to transship to the U.S. Steel facility. U.S. Steel presently has the capability to receive Class X vessels and transship ore at both Ashtabula, OH, and Conneaut, OH. Other transshipment facilities are presently operating at various other harbors including Republic Steel's transshipment facility at Lorain. However, based on U.S. Steel's decision to use Class VIII vessels at Lorain for the foreseeable future, (767 feet X 72 feet) they have requested that channel modifications be made to enable these vessels to operate at slightly greater draft.

Combined Impacts on Entire Project - Vessel traffic will increase at Lorain Harbor in the future and the harbor area will become more and more congested, as the Republic Steel transshipment facility nears capacity. With Republic Steel operating at least two Class X vessels plus a shuttle vessel full-time, AmShip launching and inspecting Class X vessels as well as smaller vessels, and U.S. Steel operating its present fleet, delays to these users and the other smaller users because of restricted channel widths are probable. This congestion problem is addressed in this Feasibility Study.

At this time it appears that encroachment of the 1,000-foot vessels at the Republic transshipment facility into the Federal channel is the primary cause of harbor congestion. A probable solution would be to provide a new river entrance channel that would permit upbound and downbound river traffic to bypass the transshipment facility at the mouth of the Black River. A new land cut to the east of the existing river entrance channel would also provide a better approach to the Erie Avenue Bridge, thus reducing this hazard to larger vessels using the river.

Port Authority - The Lorain Port Authority is actively engaged in Port promotional activities and issued industrial development bonds for the lakefront pellet terminal in August 1980. Similar bonds have been issued in the past for AmShip, Ashland Oil, and U.S. Steel.

The Authority has studied the possibility of making the Port of Lorain a general cargo transfer center. They also are applying for assistance to study the feasibility of a coal blending plant to blend low sulfur western coal with high sulfur eastern coal to produce an environmentally acceptable combination. Depending upon the success of the Port Authority, vessel traffic might increase substantially in the future. These possibilities are highly speculative, and have not been considered in establishing the "most probable future" for this study.

FORMULATION

OF

ALTERNATIVE PLANS

This section documents the formulation and evaluation of the most viable alternatives considered in preliminary planning to meet the current and future commercial navigational needs of Lorain Harbor. Objectives and criteria to develop and evaluate the alternative solutions are described. This section then identifies and screens alternative plans for bulk cargo movement at Lorain Harbor. Small-boat recreation and reduction of maintenance dredging are not considered here except where they might impact upon, or be constrained by, possible improvements for commercial navigation. Instead, they are fully addressed in Volumes 2 and 3 of the report.

MANAGEMENT MEASURES

All possible management measures available to solve a given water resources related problem must be identified during the initial stage of the study. These management measures are then combined into different alternative plans of improvement and evaluated. Based on the results of this evaluation the best alternative(s) will then be identified.

Management measures identified for this Final Feasibility Report on Commercial Navigation were divided into: (1) nonstructural measures, and (2) structural measures. The specific management measures are listed below:

a. Nonstructural

(1) Open-lake transfer of ore from maximum size vessels into smaller vessels that can be safely and efficiently accommodated within the existing Federal project at Lorain.

(2) Open-lake transfer from maximum size vessels into barges for delivery to docks along the Federal project.

b. Structural

(1) Barging from originating harbor to Lorain Harbor,

(2) LASH (lighter aboard ship) system,

(3) Rail car ferries from originating harbor to Lorain Harbor,

(4) Rail from source to Lorain Harbor,

(5) Tractor trailer from source to Lorain Harbor,

(6) Rail transshipment from another Lake Erie Port to Lorain Harbor,

(7) Tractor trailer transshipment from another Lake Erie Port to Lorain Harbor,

(8) Direct delivery of maximum size vessels to U.S. Steel or other docks along the Black River,

(9) Direct delivery of maximum size vessels to the Lakefront for transshipment.

PLAN FORMULATION AND EVALUATION RATIONALE

The formulation, evaluation, and screening of alternative plans have been done within the context of the planning objectives, and technical, economic, environmental, and other criteria described in this portion of the report. These, and other intangible considerations, permit the development of a range of feasible and economically justifiable plans which best respond to the problems and needs of the area.

Technical Criteria - These are the general technical criteria adopted in plan formulation.

a. Navigation channels and other improvements must be designed to promote safe vessel operations based on projected vessel sizes, drafts, and maneuvering capabilities if such improvements are economically justified.

b. Disruption of existing industrial, commercial, and residential development, and areas of environmental concern should be minimized.

c. Development plans should be consistent with local and regional land use plans.

d. The selected plans should be consistent with local, regional, State, and Federal goals for ports and industrial growth.

e. Plans should incorporate the most economical cargo handling methods.

Economic Criteria - The following economic criteria are used to measure the effectiveness of each alternative in meeting the objective to enhance National Economic Development.

a. Economic benefits should exceed economic costs and to the extent possible, being consistent with other criteria, net benefits should be maximized.

b. The ratio of benefits to costs will be used to evaluate conformance with the National Economic Development objectives. The plan which best meets the objectives of the National Economic Development objectives is the least costly water or nonwater plan which meets those criteria regardless to the extent of Federal and non-Federal participation in implementation costs.

The preliminary plans developed are based on the National Economic Development objectives. The plans are then assessed to determine their effect on other objectives and criteria.

Environmental and Other Criteria - The following environmental and social evaluation criteria are adopted to evaluate alternatives which are developed in plan formulation:

a. Minimize the use of scarce natural resources to implement or operate the selected plans.

b. Incorporate in the selected plans measures which protect, preserve, or enhance the environmental quality in the project.

c. Minimize adverse impacts on areas of archeologic, historic, and cultural significance and to the extent possible preserve or enhance these areas.

d. Give equal consideration to fish and wildlife purposes in the study and minimize impacts on existing fish and wildlife resources in the study area.

e. Minimize the adverse social impacts such as displaced home sites and people, traffic congestion, noise, loss of aesthetic values, and health hazards.

f. Minimize any adverse impacts on local employment and business opportunities, and to the extent possible, enhance or preserve local job opportunities.

g. Minimize any adverse impacts on availability of water acreage for recreational boating, and to the extent possible, preserve or enlarge these areas.

h. Arrange the selected plans such that if one is implemented, the ancillary development following plan implementation would be compatible with activities of the surrounding area, and be environmentally and socially acceptable.

i. Minimize adverse effects on or improve air and water quality.

POSSIBLE CONCEPTS FOR BULK CARGO MOVEMENT

A full range of concepts for movement of bulk cargo were considered during plan formulation. In general, these either provide for modification to the existing harbor to allow more economical waterborne movement, or provide for a land mode of transportation for all or part of the bulk cargo movement.

Development of Initial Concepts - Within the prescribed planning framework and established criteria, possible solutions were identified and will be evaluated in a three-stage iterative process to address the needs of the study area and overall planning objectives. Each stage includes four functional planning tasks: problem identification; formulation of alternatives; impact assessment; and evaluation. Each stage contains essentially the same sequence of tasks, but with differing emphasis.

The results of the Preliminay Feasibility Report (PFR) including the planning and assessment and evaluation of various alternatives developed using the study objectives previously delineated are presented below. The alternatives discussed were formulated in accordance with the planning objectives developed for the study and the various technical, economic, and environmental criteria. The following structural and nonstructural concepts, were identified during the initial phase of plan formulation. Alternative plans were developed from these concepts and they were evaluated against the "without project" conditions described previously in this report.

Concept 1 - Movement of large vessels to the upstream limit of the Federal project at Lorain Harbor (direct delivery)

Concept 2 - Movement of large vessels to a transshipment facility on the Black River near the 21st Street Bridge (partial transshipment)

Concept 3 - Movement by large vessels to the Outer Harbor (lakefront transshipment)

Concept 4 - Delivery by maximum size vessels to a designated location in Lake Erie and transfer of cargo to (1) smaller ships or (b) barges, this is considered a nonstructural alternative in the context of this overall study,

Concept 5 - Delivery to Lorain by barge from the originating harbor,

Concept 6 - Delivery by a "lighter-aboard-ship" or LASH system,

Concept 7 - Delivery by vessels or barges that carry railroad cars,

Concept 8 - Delivery by all rail movement from originating area,

Concept 9 - Delivery to another port in maximum size vessels and transshipment to Lorain.

Initial Iteration For Nonstructural Concepts

Concept 4 - This nonstructural conceptual solution was eliminated in the PFR after preliminary consideration for economic or technical reasons. Following is a discussion of two variations of this concept and reasons for their elimination from further consideration.

a. Concept 4A - Ship to Ship Transfer

This nonstructural concept would involve delivery of ore in Class X vessels to a location in Lake Erie outside of Lorain Harbor. The ore would then be transferred into vessels, Class 7 and smaller, capable of safely and efficiently utilizing the existing harbor.

This concept was eliminated due to environmental, economic, and operational considerations. Ships in the open-lake are subject to winds and waves that would make transfer of ore without spillage very difficult. The need for shifting of the smaller vessels during transfer would also greatly increase

the possibility of collisions and damage to both vessels. Construction of any facilities to eliminate these problems is impractical in the open-lake area.

This concept is also impractical from an economic standpoint. It would require either three Class VI vessels to unload one Class X vessel or three trips by one Class VI vessel. If three vessels were used, the Class X vessel would not be delayed, but there would be considerable wasted time for the three Class VI vessels while waiting for the next vessel. If only one Class VI vessel were used, there would be considerable delay for the Class X while waiting for the Class VI vessel to unload and return. For these reasons this alternative was not considered further.

b. Concept 4B - Ship to Barge Transfer

Open-lake transfer of ore from Class X vessel to barges is similar to the concept discussed above. It would have many of the same problems associated with ship to ship transfer such as possible spillage, damage to the Class X vessel and the barges, wind and wave induced operational problems. There would also be a requirement for an extremely large number of barges to totally unload a Class X vessel. Because of these many problems, this alternative was not considered further.

Initial Iteration for Structural Concepts - Five of the structural conceptual solutions considered in a preliminary manner in the early stages of plan formulation were abandoned as possible solutions for economic or technical reasons. Among these were the following, which either incorporated variations to the present mode of cargo transport to the harbor, or to the cargo movement within the harbor.

a. Concept 5

This concept considered interlake movement based on a barging system typically used on the inland waterway system. Direct barging of bulk materials could be accomplished with only minor change to the present harbor. Such an operation would in effect be similar to a direct vessel delivery by bulk carriers and a transfer of materials to barges for local distribution. Numerous questions regarding costs of modifying "source" harbor facilities and the efficiency and safety of barges on the open lakes were also considered in discontinuing evaluation of this alternative in its entirety. An alternative which includes bulk carrier delivery to the outer harbor and barge transshipment up the Black River was given further study.

b. Concept 6

Another possible concept for direct waterborne movement was a "lighter-aboard-ship" or LASH system similar to the Seabee system. These shipping methods utilize vessels constructed to carry lighters or barges within their hulls which are hoisted aboard the "Mother Ship" by a large gantry crane or an elevator mounted on the vessel. This shipping concept is now used at several ports on the Gulf Coast with vessels over 890 feet long and capable of carrying about 30,000 net tons of cargo. Applicability of such a shipping

vehicle and system to the bulk cargo trade on the Great Lakes involves technical problems relating to the relatively high unit weights of iron ore and stone cargo. Physical changes in the configuration of the "Mother Ship" to conform to the locks and navigation channels in the Great Lakes would be required. The application of the LASH system at Lorain would be limited to moving cargo bound for upriver locations.

c. Concept 7

Another possible concept was the shipping of bulk cargoes on vessels capable of carrying railroad cars directly, e.g., railroad car ferries, from origin harbor to Lorain, Ohio. Such a system would require an inordinate number of railroad cars with the consequent deadweight. Further, the interlake movement of such a system could be hazardous during storm conditions.

Major terminal changes to handle the railroad cars would be required at both the origin and destination harbors. This alternative was not considered further.

d. Concept 8

All-rail movement of iron ore from Lake Superior to Lorain was considered. U.S. Steel does not presently receive a significant amount of iron ore in railroad cars. Sporadic receipts might be based on a need for an ore with a special analysis or raw materials necessary to supplement the inventory on a seasonal basis.

The estimated rate for all-rail movement from the Mesabi Range to Lorain, OH, would be $31.00 per ton. A combined rail-water movement for the same commodity is estimated to be $12.70 per ton. Unit train movements would undoubtedly be lower but would require installation of extensive unloading facilities at the upriver steel plant to efficiently unload and release unit trains.

It is unlikely that "all rail movements" will account for a large percent of total iron ore movements within the Great Lakes region because the substantial savings associated with the combined rail-water movement and the financial investments in new facilities required at receiving plants to accommodate an all-rail mode of movement.

e. Concept 9

Another possible concept for moving iron ore to Lorain would be to ship iron ore by Class VI through Class X vessel to another Lake Erie port and then transship to Lorain by rail. This concept was recently implemented at Lorain where Republic Steel constructed a transshipment facility that can service 1,000-foot ore carriers economically. The ports of Toledo, Huron, Cleveland, Ashtabula, and Conneaut all have docks engaged in transshipping iron ore to inland plants. However, harbor, dock and stockpiling facility modifications would be required to handle the volume of material destined for Lorain Harbor.

While this alternative is feasible for the smaller vessels (Class VI or Class VII), there would be about a $5.00 per ton line haul charge to rail each ton to the Lorain steel plant from alternate Great Lakes harbors. This line haul cost is an estimated average rate based on published tariff rates for comparable hauls. The Lorain plant presently can accommodate coal receipts by rail but substantial investments in new facilities to handle iron ore would be required. Transshipment of significant tonnages through other Lake Erie ports will probably not develop.

The Initial Iteration of structural and non-structural concepts did not include consideration of slurry pipelines for either in-lake transfer or from a lakefront transshipment terminal. The rationale for this was that this solution is neither currently in use by the steel industry nor contemplated within the GLSLS. Further consideration of this concept will not be made. After eliminating the above concepts from further consideration (Concepts 4, 5, 6, 7, 8 and 9) in the Initial Iteration, the remaining concepts (Concepts 1, 2, and 3), all involve shipment of iron ore to Lorain in Class X vessels. These remaining concepts were then developed into alternative plans of improvement for modifying the existing Federal harbor at Lorain to serve Class X vessels in the Second Iteration.

Second Iteration

Development of Alternatives - Each concept not eliminated in the Initial Iteration phase was investigated in greater detail to determine what modifications would be necessary for implementation. It was determined that there are several alternatives that would fulfill the requirements of each concept.

The alternatives that were investigated in the Preliminary Feasibility Stage are:

Concept 1 (Direct Delivery Upriver)

Alternative 1 - Direct delivery by maximum size vessels to the upstream end of the Federal project including outer harbor modifications, Riverside Park cut, enlarged channel, enlarged upper turning basin, and new 21st Street Bridge.

Alternative 2 - Similar to Alternative 1 except instead of a Riverside Park cut, the Erie Avenue Bridge would be replaced with a high level bridge.

Alternative 3 - Similar to Alternative 2 except the Erie Avenue Bridge would be replaced with a movable bridge.

Alternative 4 - Similar to Alternatives 2 and 3 except the Erie Avenue Bridge would be replaced by a tunnel.

Concept 2 (Delivery in maximum size vessel to Transshipment Facility at 21st Street Bridge)

Alternative 5 - Delivery by a maximum size vessel to a transshipment facility constructed just north of the 21st Street Bridge including outer

harbor modifications, new channel through Riverside Park, enlarged channel, enlarged lower turning basin, transshipment facility, and conveyor upriver from 21st Street.

Alternative 6 - Similar to Alternative 5 except that instead of a Riverside Park cut, the Erie Avenue Bridge would be replaced by a high level bridge.

Alternative 7 - Similar to Alternative 6 except that the Erie Avenue Bridge would be replaced with a movable bridge.

Alternative 8 - Similar to Alternative 6 except that the Erie Avenue Bridge would be replaced by a tunnel.

Concept 3 (Delivery in maximum size vessels to Lakefront Transshipment Facility)

Alternative 9 - Delivery to the Lakefront in maximum size vessel to a newly constructed transshipment facility including outer harbor modifications, lakefront transshipment facility, and an upriver conveyor system.

Alternative 10 - Similar to Alternative 9 except instead of an upriver conveyor system a special purpose vessel would be used to transport the ore upriver.

Alternative 11 - Similar to Alternatives 9 and 10 except a rail facility would be utilized to move the ore upriver.

Alternative 12 - Similar to Alternatives 9, 10, and 11 except a truck system would be utilized to move the ore upriver.

Alternative 13 - Same as Alternative 9 except for the addition of a cut through Riverside Park.

Alternative 14 - Same as Alternative 10 except for the addition of a cut through Riverside Park.

Alternative 15 - Same as Alternative 11 except for the addition of a cut through Riverside Park.

Alternative 16 - Same as Alternative 12 except for the addition of a cut through Riverside Park.

Alternative 17 - No action, Do Nothing Plan.

These alternative plans are discussed further in the next section of this report.

Effects of Commercial Navigation Alternatives on Recreational Navigation - As part of the overall Lorain Harbor Study, the impacts of the commercial navigation alternatives will have to be assessed as they impact upon the recreational navigation study. The major feature considered in the commercial navigation study which would affect the small-boat harbor is the Riverside Park Cut channel. As detailed in Volume 2 of the overall Lorain Harbor study which deals with recreational navigation, the area being considered for the small-boat harbor is in the east basin of the harbor located just west of the East Breakwater Shorearm and the Diked Disposal Area.

The construction of a new channel through Riverside Park would have the effect of limiting the amount of water area available for development of the small-boat harbor. This new channel would also require the construction of a new inner breakwater parallel to the commercial navigation channel (see Plate 5 for a typical view of the effects the new Riverside Park Cut channel and new inner breakwater would have on development of the small-boat harbor in the east basin.) The results of the commercial navigation study as it effects recreational navigation are discussed in Volume 2 of the overall Lorain Harbor Study.

PLANS OF OTHERS

The Lorain Port Authority is actively engaged in an effort to attract industry and commerce to the Lorain harbor area. An example of this activity is the decision of Republic Steel to locate their new transshipment facility in Lorain. Other examples of efforts to attract new commerce and industry include a survey of area businesses to determine interest in a general cargo transfer center, application for grants to study the feasibility of a coal blending plant, and plans for a 600-slip marina to be built on the east side of the harbor near the dike disposal area.

Improvements to the harbor to aid safe and efficient navigation would be in line with the desires of the Port Authority to expand use of the harbor. None of the alternatives outlined in this report would interfere with the plans of the Port Authority.

Republic Steel has built-in capability for expansion of their new pellet terminal if the need arises. This would increase the frequency of deliveries by Class X vessels. Improvements to the harbor would benefit Republic even more if this were to happen.

U.S. Steel has stated that expansion of their facility in Lorain is a possibility, but that the expansion is contingent upon availability of low cost raw materials. Improvements to Lorain Harbor would help insure that U.S. Steel would be able to utilize the most efficient means of delivery of raw materials currently moving on the Great Lakes system.

Improvements to the harbor as outlined in this report will not adversely impact upon plans of others. More over plans of others will be enhanced by the improvements.

ASSESSMENT AND EVALUATION

OF

PRELIMINARY PLANS

This section provides a summary of the engineering design, economic evaluation, and environmental assessment of commercial navigation alternatives developed in the Prelinary Feasibility Studies, that had the greatest potential for meeting the planning objectives.

During the Preliminary Feasibility stage, alternative plans for both a 1,000-foot X 105-foot and 1,200-foot X 130-foot vessel were formulated. However, since subsequent system wide studies by the Corps' North Central Division and Detroit District concluded that the most probable maximum vessels expected on the Great Lake for the foreseeable future is the Class X (1,000-foot X 105-foot) vessel, the 1,200-foot vessel was dropped from further consideration at Lorain Harbor. Therefore, the 1,200-foot vessels will not be discussed in this report.

These alternatives are:

Alternative 1 - Direct delivery by Class X to the upstream end of the Federal project including outer harbor modifications, Riverside Park Cut, enlarged channel, enlarged upper turning basin, and new 21st Street Bridge.

Alternative 2 - Similar to Alternative 1 except instead of a Riverside Park Cut, the Erie Avenue Bridge would be replaced with a high level bridge.

Alternative 3 - Similar to Alternative 2 except the Erie Avenue Bridge would be replaced with a movable bridge.

Alternative 4 - Similar to Alternatives 2 and 3 except the Erie Avenue Bridge would be replaced by a tunnel.

Alternative 5 - Delivery by a Class X vessel to a transshipment facility constructed just north of the 21st Street Bridge including outer harbor modifications, new channel through Riverside Park, enlarged channel, enlarged lower turning basin, transshipment facility, and conveyor upriver from 21st Street.

Alternative 6 - Similar to Alternative 5 except that instead of a Riverside Park Cut, the Erie Avenue Bridge would be replaced by a high level bridge.

Alternative 7 - Similar to Alternative 6 except that the Erie Avenue Bridge would be replaced with a movable bridge.

Alternative 8 - Similar to Alternative 6 except that the Erie Avenue Bridge would be replaced by a tunnel.

Alternative 9 - Delivery to the Lakefront in Class X vessel to a newly constructed transshipment facility including Outer Harbor modifications, lakefront transshipment facility, and an upriver conveyor system.

Alternative 10 - Similar to Alternative 9 except instead of an upriver conveyor system, a special purpose vessel would be used to transport the ore upriver.

Alternative 11 - Similar to Alternatives 9 and 10 except a rail facility would be utilized to move the ore upriver.

Alternative 12 - Similar to Alternatives 9, 10, and 11 except a truck system would be utilized to move the ore upriver.

Alternative 13 - Same as Alternative 9 except for the addition of a cut through Riverside Park.

Alternative 14 - Same as Alternative 10 except for the addition of a cut through Riverside Park.

Alternative 15 - Same as Alternative 11 except for the addition of a cut through Riverside Park.

Alternative 16 - Same as Alternative 12 except for the addition of a cut through Riverside Park.

In addition, the basis of comparison for the alternatives listed above is .

Alternative 17 - No Action, Do Nothing Plan.

A description of the 17 preliminary alternatives considered and summary cost/benefit data are discussed in the following paragraphs. All costs are based on May 1980 price levels. Average annual costs are based on an interest rate of 7-3/8 percent and a 50-year life. Both the cost and benefit data are considered adequate to identify those alternatives that warrant further, and in more detailed study.

In developing these alternative plans of improvement, it was determined that a total of 16 principal construction items (or project features) would be required. Plate 4 shows the location of these construction items. A matrix showing the construction items common to each alternative is provided in Table 16.

ALTERNATIVE 1 (DIRECT DELIVERY WITH RIVERSIDE PARK CUT)

Description of Alternative 1 - This alternative includes improvements for the entire authorized project area from the Outer Harbor to the Upper Turning Basin that would allow for passage of 1,000-foot vessels over the entire length of this area. Plate 5 shows the various construction items of this alternative.

In the Outer Harbor, Item A, improvements would include removal of 600 feet of the East Breakwater and a 600-foot addition to the Outer Breakwater. A new Inner Harbor Breakwater would be constructed to protect a proposed small-boat marina along the East Shorearm Breakwater. The Outer Harbor would be

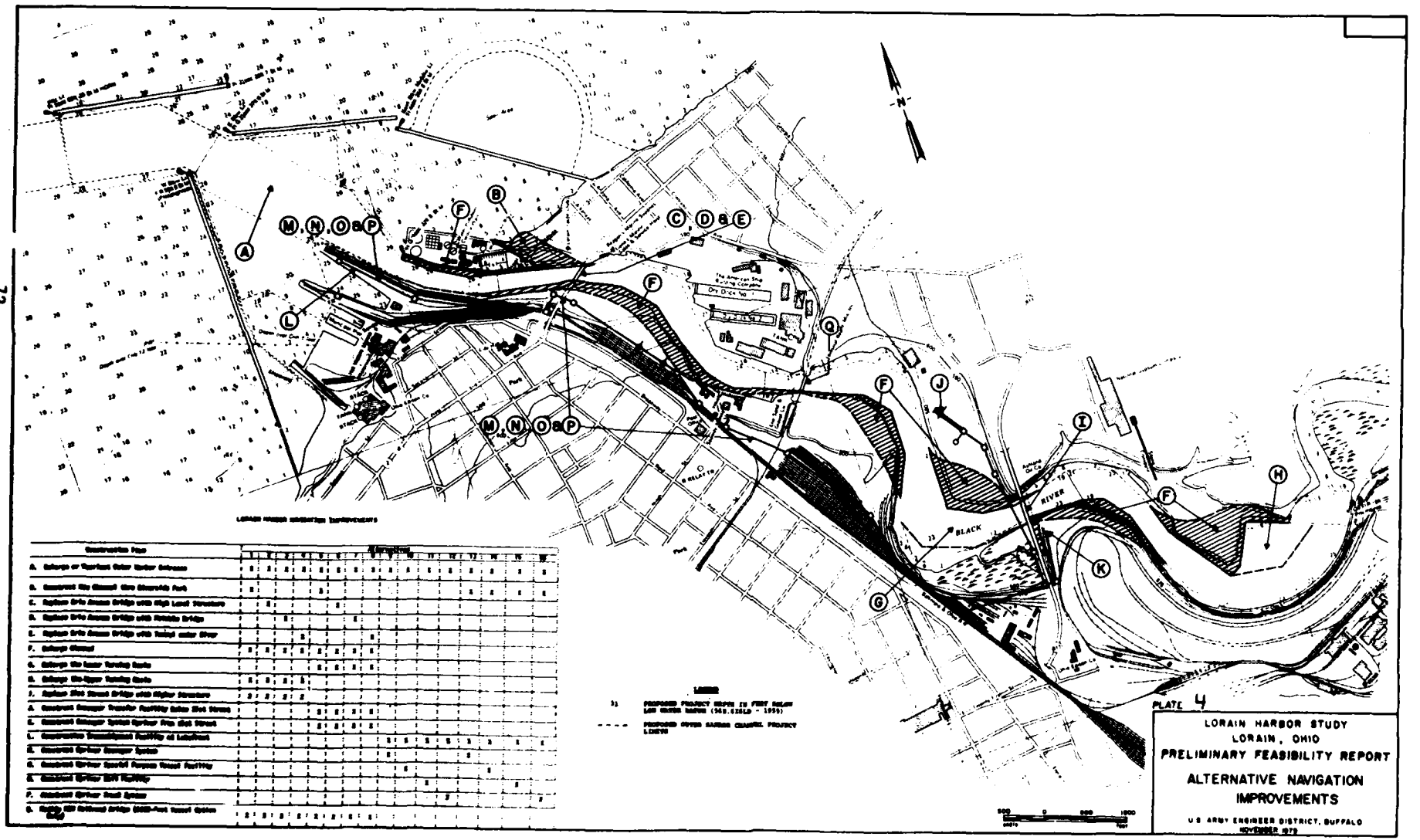
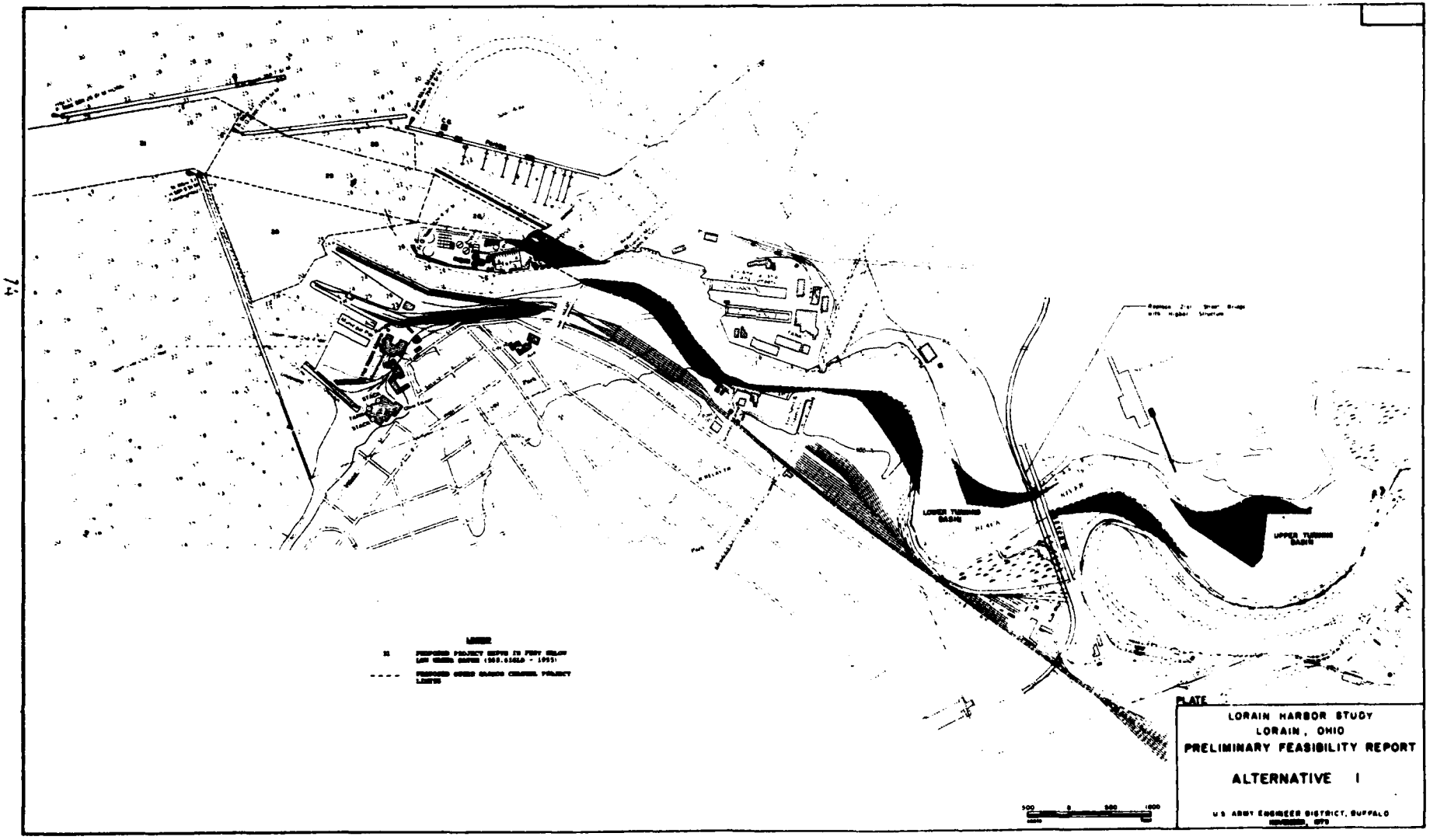


PLATE 4

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT
ALTERNATIVE NAVIGATION IMPROVEMENTS
U.S. ARMY ENGINEER DISTRICT, BUFFALO
NOVEMBER 1979

Table 16 - Lorain Harbor Navigation Improvements 1,000-Foot Vessel Option

Construction Item	Alternatives															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A. Enlarge or reorient Outer Harbor entrance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
B. Construct new channel thru Riverside Park	X				X								X	X	X	X
C. Replace Erie Avenue Bridge with high level structure		X				X										
D. Replace Erie Avenue Bridge with movable bridge			X				X									
E. Replace Erie Avenue Bridge with tunnel under river				X				X								
F. Enlarge channel	X	X	X	X	X	X	X	X								
G. Enlarge the lower turning basin					X	X	X	X								
H. Enlarge the upper turning basin	X	X	X	X												
I. Replace 21st Street Bridge with higher structure	X	X	X	X												
J. Construct conveyor transfer facility below 21st Street					X	X	X	X								
K. Construct conveyor system upriver from 21st Street					X	X	X	X								
L. Construction transshipment facility at lakefront									X	X	X	X	X	X	X	X
M. Construct upriver conveyor system									X				X			
N. Construct upriver special purpose vessel facility										X				X		
O. Construct upriver rail facility											X				X	
P. Construct upriver truck system												X				X



PLATE

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT

ALTERNATIVE I

U.S. ARMY ENGINEER DISTRICT, BUFFALO

dredged an additional 3 feet to allow larger vessels to enter at system draft under heavy weather conditions.

A new channel 300 feet in width to accommodate 1,000-foot vessels would be constructed through Riverside Park, construction Item B. This realignment of the entrance to the Black River would permit vessel passage more nearly normal to the leaves of the existing Erie Avenue bascule bridge. This would make passage of a 1,000-foot vessel under the Erie Avenue Bridge possible without tug assistance which would eliminate replacement of this bridge. In addition, cuts to widen the existing channel would be made to the Upper Turning Basin. These channel cuts (Item F) and Upper Turning Basin improvements (Item H) would significantly improve maneuvering and bank clearance lanes for 1,000-foot vessels.

Upriver, the existing 21st Street high level bridge would be replaced with a high level three span continuous through truss bridge with a 600-foot main span over the river and the proper height clearance for 1,000-foot vessels (Construction Item I). Slight relocation of the bridge would result in both local and through traffic moving more freely due mainly to the elimination of the complex 21st Street-Elyria Avenue intersection and street relocations. Some predominantly commercial areas would be permanently lost due to extended length of the new bridge, with no equivalent return upon removal of the existing bridge. The new bridge would meet current road width requirements.

Cost Estimate for Alternative 1 - The total estimated first cost for Alternative 1, including land acquisition, is $170.9 million. The total investment cost, including interest during construction is $189.0 million and the total average annual charges are $15.3 million.

Economic Evaluation of Alternative 1 - Benefit categories included in the alternative are: (1) iron ore transportation savings, and (2) future vessel launching costs avoided. The total average annual benefits for Alternative 1 are $17,400,000. The net benefit is $2,100,000 and the B/C ratio is 1.14. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 17.

Table 17 - Summary of Benefits and Costs for Alternative 1 (1)

	Average Annual Charges ($ million/yr.)	Average Annual Benefits ($ million/yr.)	Net Average Annual Benefits ($ million/yr.)	Benefit/Cost Ratio
Total Project	15.3	17.4	2.1	1.14

(1) May 1980 price levels and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 1 - Removal of 600 feet of the East Breakwater would expose approximately 0.69 acres of substrate composed of silt, rock, and some exposed bedrock which could provide aquatic habitat,

while a 600-foot addition to the Outer Breakwater would cover approximately 1.02 acres of substrate composed of silt, rock, and some exposed bedrock which had provided aquatic habitat. The breakwater extension would be constructed of cellular steel sheet pile with rubblemound toe protection. This stone would provide 0.56 acre of colonizable aquatic habitat. Removal of 600 feet of the East Breakwater, also constructed of cellular steel sheet pile with rubblemound toe protection, would remove 0.20 acre of colonizable aquatic habitat provided by this stone. The habitat described here is of low value due to severe limiting factors such as poor water quality, deep water depths, and disturbances for commercial navigation. Therefore, impacts from removal and extensions of the breakwaters would be minimal. Still, a moderately-diverse fish community persists in Lorain Harbor. The amount of habitat provided and destroyed is summarized in the following table:

	Habitat Provided	Habitat Removed
Remove 600 feet of East Breakwater	0.69 acre	0.20 acre
Add 600 feet to Outer Breakwater	0.56 acre	1.02 acres

Reorientation of the Outer Harbor entrance channel would allow the larger vessels to easily and safely steer into position to move upriver or into a lakefront transshipment facility; however, the reorientation may have negative aesthetic impacts during construction on the West Breakwater Lighthouse, a structure listed on the National Register of Historic Places. This reorientation of the breakwaters may also affect the wave climate in the harbor by causing increased wave action due to the increased harbor opening.

Temporary noise and air pollution would be experienced during construction; however, since this is a highly industrialized area, the effects should be minimal. The Outer Harbor would be dredged an additional 3 feet which would amount to about 380,000 cy of polluted dredged material and 760,000 cy of nonpolluted dredged material for a total of 1,140,000 cy. Polluted material would be disposed of at the existing diked disposal site. Nonpolluted material would be disposed of at a designated open-lake site. Including the channel to the Riverside Park Cut, these quantities would increase to 449,000 cy of saturated polluted material, 1,064,000 of saturated nonpolluted material, and 287,000 cy of rock, for a total of about 1,797,000 cy. Dredging would result in a temporary increase in water pollution, turbidity, and sediment loads.

A new channel would be constructed through Riverside Park. This realignment of the entrance to the Black River would permit vessel passage more nearly normal to the leaves of the existing Erie Avenue Bascule Bridge and would, thereby, eliminate replacement of this bridge. This channel cut would be 300 feet wide for the 1,000-foot vessels and would have vertical banks protected by steel sheet pile. This land area to be excavated for the channel would become aquatic, thereby providing bottom habitat, probably of low value due to deep depths and vertical channel side slopes equal to the amount of land excavated, approximately 5.40 acres. Steel sheet pile bank protection would not provide colonizable macrobenthos habitat. This cut would result in about

124,000 cy of saturated nonpolluted material, 93,000 cy of nonstructural material, and about 50,000 cy of rock, for a total of approximately 267,000 cy.

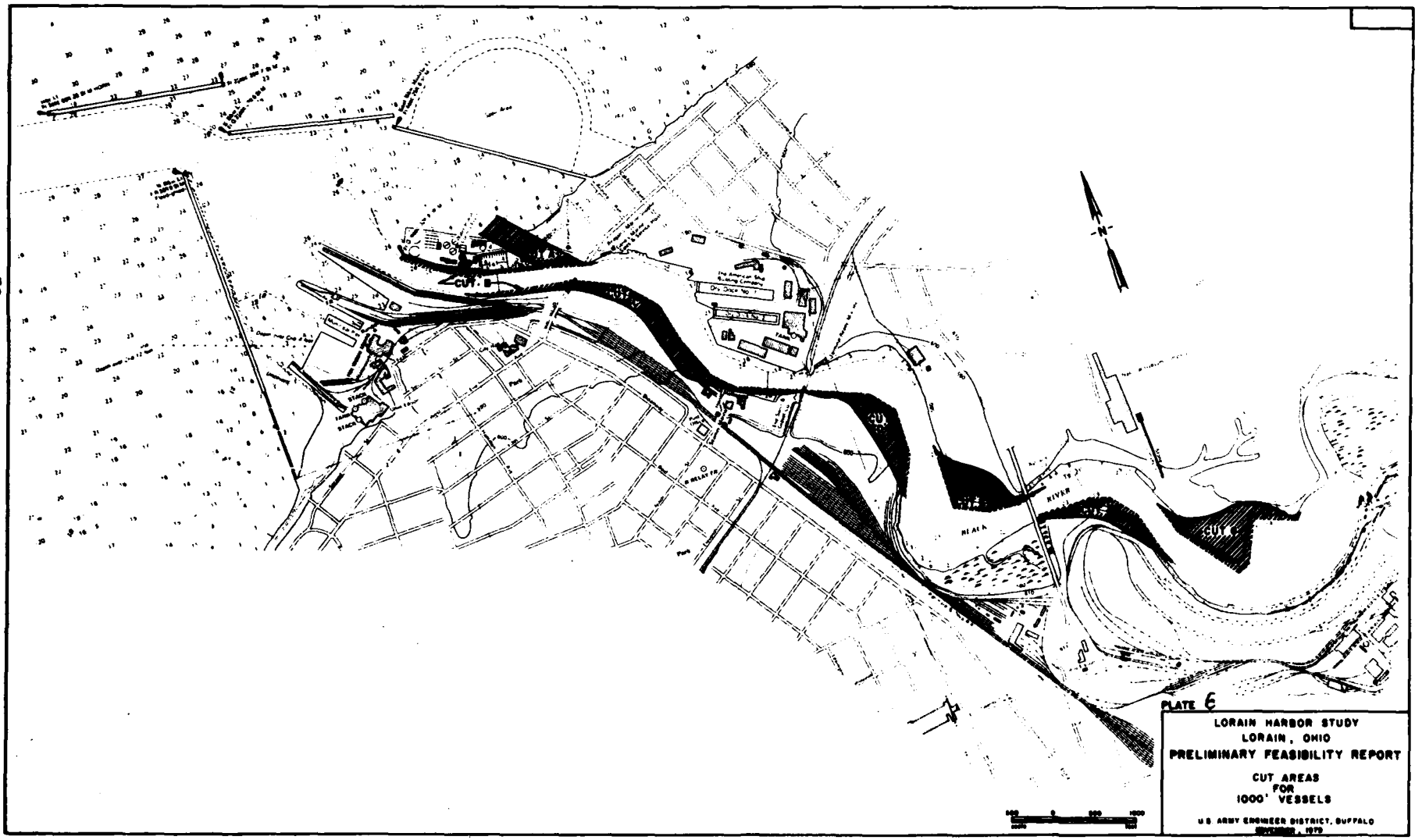
The Riverside Park Cut feature of this Alternative would have an impact on the development of a small-boat marina which is proposed in the East Basin of the Outer Harbor (see Volume 2 of the Lorain Harbor study for details of this small-boat harbor). The commercial navigation channel required in the East Basin of the harbor would reduce the water area available for development of this proposed small-boat harbor. Also, it would require the construction of a new inner harbor breakwater to protect the proposed small-boat marina from both wave action from the lake and the wakes of the large commercial vessels using the new channel.

According to the U.S. Fish and Wildlife Service (USFWS) in their Intermediate Coordination Act Report dated 22 January 1981 (see Appendix F), the major impact of work in the Outer Harbor involves the deepening of previously-undredged areas to enlarge the turning areas and to create the new channel leading to the Riverside Park Cut. All of this new dredging would occur in the 70 acres of presently undredged habitat on the east side of the Outer Harbor. The Riverside Park Cut would require dredging of approximately 32 acres of previously undredged bottom habitat. The conversion of relatively-shallow, undisturbed areas to deep, annually-dredged areas will decrease the spawning potential of the areas, reduce the benthic production, and reduce the annual fish biomass production of the areas.

A channel through this area would destroy a major part of Riverside Park, thus negating the recreational opportunities offered by this park. It may also require some relocations of Coast Guard facilities, relocation of utilities and relocation of approximately three homes. Access to the wastewater treatment plant could be provided by driving two sets of sheet pile and filling the existing Black River channel between them. Blocking the existing channel in this manner is recommended so that the main flow would exit through the new cut, thereby reducing the sedimentation of the channel. A submerged culvert should be provided in the fill across the existing channel to avoid creating a stagnant pool in the existing channel along the west side of the treatment plant.

Channel widening at various points on both sides of the river would allow 1,000-foot vessels to navigate to the Upper Turning Basin. The cuts would take land owned primarily by the railroads and U.S. Steel.

The land excavated for the bank cuts would provide an equal amount of aquatic habitat. Plate 6 shows the location of these bank cuts for Alternative 1. The following table shows land acquisition in acres for each bank cut and is shown in Plate 6.


CUT
CUT
PLATE 6
LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT
CUT AREAS
FOR
1000' VESSELS
U.S. ARMY ENGINEER DISTRICT, BUFFALO

Bank Cut	Acres
C-1	5.20
C-2	15.27
D	12.51
E-1	6.54
E-2	10.79
F	10.27
G	16.70

Utilities would have to be relocated with cut C-2 for each option. Implementation of this alternative would result in the loss of 12.5 acres of wooded habitat in Cut D and 6.5 acres of shrub habitat in Cut G. The rest of the proposed bank cuts involve areas that have very limited wildlife values because of prior commercial development. The wooded area in Cut D and the shrub area in Cut G presently support a number of small mammals and songbirds that would be forced to move to nearby habitat if the bank cuts are made. Cut C may infringe on an existing small-boat harbor located north of the N&W Railroad Bridge. Steel sheet pile used as bank protection in critical areas subject to erosion (approximately 3,100 feet) would provide no colonizable aquatic habitat. According to the USFWS (see Appendix F), many of the fish species persisting in the Inner Harbor are dependent on the remaining shallow water areas, a narrow band bordering the navigation channel, and the limited cover provided therein. If spawning is occurring in this section of the river, in spite of the water quality degradation, it is probably occurring in the shallow water areas. This alternative would involve the elimination of more than one-half (approximately 3,100 feet) of the narrow band of shallow water habitat bordering the navigation channel between the river mouth and the Upper Turning basin.

Enlarging the Upper Turning Basin would allow the design vessels to turn 180 degrees and return downriver.

Replacing the 21st Street Bridge with a higher structure would allow 1,000-foot vessels to navigate through this section of the channel. With the proposed structure, both local and through traffic could move more freely due to the elimination of the complex 21st Street-Elyria Avenue intersection and street relocations. The existing structure would be kept in service until the new structure was open to traffic by staged construction and temporary access roads. Therefore, traffic disruption would be minimal. Some predominantly commercial areas would be permanently taken with no equivalent return upon removal of the existing structure. This is due to the greater length of the new structure intruding into areas at both ends not affected by the existing structure. The alignment downstream fully meets alignment criteria

although the curves on the bridge are not particularly desirable. This alignment also crosses over the existing railroad underpass.

Evaluation of Alternative 1 - Alternative 1 fulfills the planning objective of improving Lorain Harbor for navigation by Class X or larger vessels. The average annual benefits exceed the average annual cost. However, other alternatives in this study assure an efficient project operation as well as Alternative 1 and also have significantly higher net benefits. This alternative is also among the highest cost alternatives and requires the most disruption of existing conditions. Therefore, Alternative 1 was not considered further.

ALTERNATIVE 2 (DIRECT DELIVERY WITH NEW HIGH-LEVEL ERIE AVENUE BRIDGE)

Description of Alternative 2 - This alternative is similar to Alternative 1, except in lieu of constructing the new channel through Riverside Park (Construction Item B), the existing river entrance would be used and the existing Erie Avenue Bridge would be replaced with a high level structure (Construction Item C). The construction items are shown on Plate 7.

The proposed high level bridge replacement at Erie Avenue would be a three-span continuous, through truss structure that would allow sufficient under clearance for passage of 1,000-foot vessels. The total length, which includes approach fills and spans, and the length of the three-span structure, would be approximately 5,000 feet. Large areas of predominantly residential land would be taken for construction and permanent easement. Traffic would move more freely over the new bridge, but local traffic would be adversely affected by the widely separated points of access to the bridge.

Cost Estimate for Alternative 2 - The total estimated first cost for Alternative 2, including land acquisition, is $221.0 million. The total investment cost, including interest during construction, is $244.1 million and the total average annual charges are $19.9 million.

Economic Evaluation of Alternative 2 - Benefit categories included in this alternative are: (1) iron ore transportation savings, (2) future vessel launching costs avoided and (3) advance replacements. The total average annual benefit for Alternative 2 is $17,600,000. The net benefit is -$2,300,000 and the B/C ratio is 0.88. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 18 below.

Table 18 - Summary of Benefits and Costs for Alternative 2 (1)

	Average Annual Charges ($ million/yr.)	Average Annual Benefits ($ million/yr.)	Net Average Annual Benefits ($ million/yr.)	Benefit/Cost Ratio
Total Project	19.9	17.6	-2.3	0.88

(1) May 1980 price levels and 7-3/8 percent interest rate.

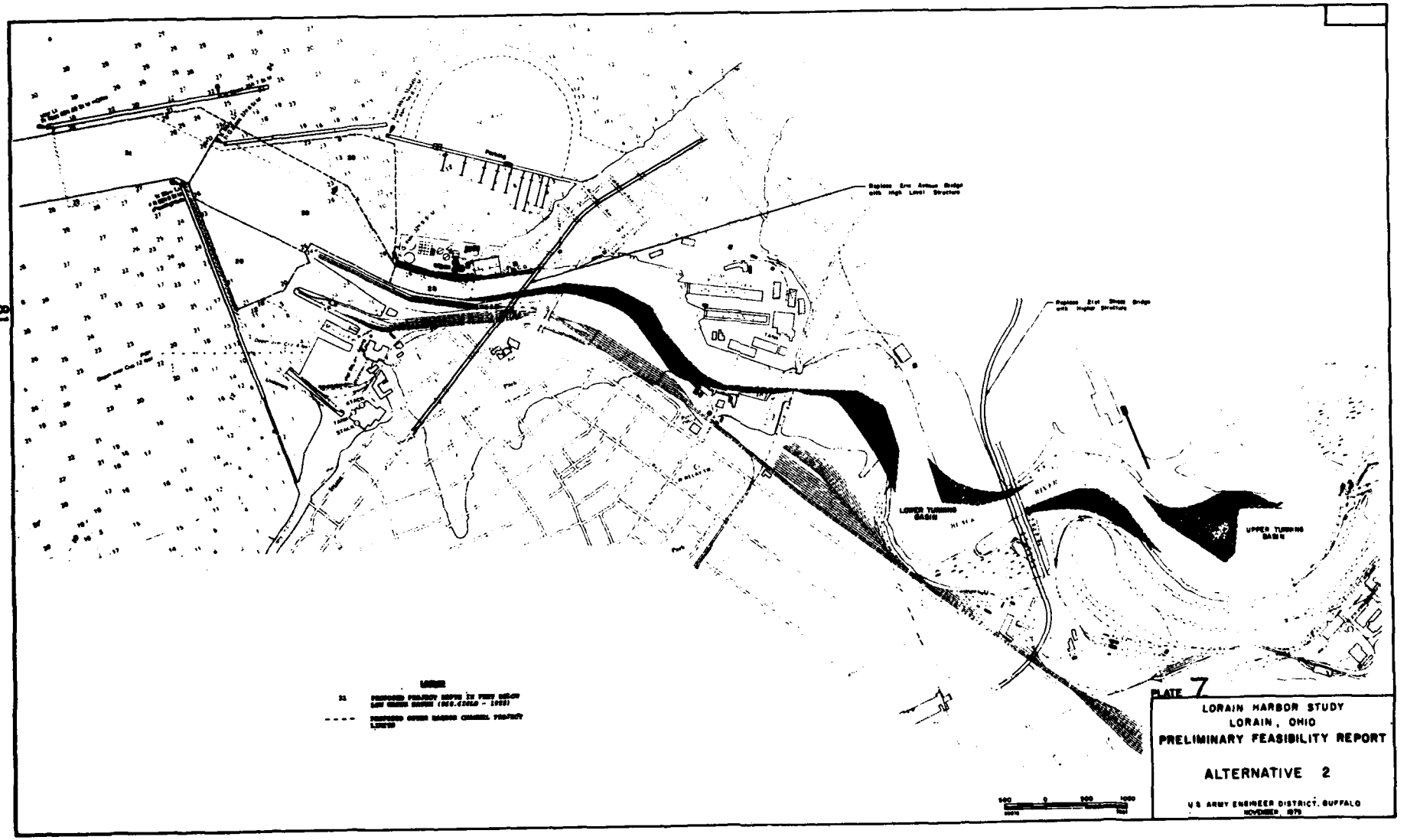


PLATE 7

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT

ALTERNATIVE 2

U.S. ARMY ENGINEER DISTRICT, BUFFALO
NOVEMBER, 1979

Environmental Features/Assessment of Plan 2 - This alternative would be similar to Alternative 1, except in lieu of constructing the new channel through Riverside Park, the existing river entrance would remain, and the existing Erie Avenue Bridge would be replaced with a high level structure. Even though the Riverside Park Cut is not included, approximately 20 acres of previously-undredged habitat would be dredged to deepen and enlarge the turning areas. According to USFWS, the conversion of relatively-shallow, undisturbed areas to deep, annually-dredged areas would decrease the spawning potential of the areas, reduce the benthic production of the areas, and reduce the annual fish biomass production of the areas.

Cut B along the existing river entrance would allow 1,000-foot vessels to enter the river channel. Property taken for this cut would be commercial, primarily owned by the railroads. For 1,000-foot vessels, 4.88 acres would become very deep, relatively low quality aquatic habitat. The shallow water habitat which had bordered the navigation channel in this area would be eliminated. According to FWS, this shallow water area provides potential spawning grounds for fish species. Utilities would have to be relocated with Cut B for each option. This cut may also infringe on an existing marina located between the water treatment plant and the Coast Guard facility. Steel sheet pile used as bank protection would not provide aquatic habitat.

Replacement of the Erie Avenue Bridge with a high level structure would allow through or crosstown traffic to move more freely over a route of virtually unchanged length. The structure grades would have some adverse effect, but there would be no intersections or stoppages for passage of river vessels. Local traffic would be adversely affected in some cases due to the widely separated points of access to the bridge. The existing structure would remain in service until the new bridge was open to traffic. Interference with traffic during construction would be minimal and mostly on side streets.

It is anticipated that the land under and immediately adjacent to the bridge would be permanently vacated, and could not be used for any commercial, industrial, or residential purposes. The amount of land so affected would be substantial, varying to some slight degree, depending on the exact location of the structure in relation to property lines. With 125- or 135-foot clearance, the top of the center span truss would be in the order of 200 feet above water. The total structure would be in the order of 5,000 feet in length. In combination with the level terrain, these factors indicate the structure would visually dominate the surrounding area. This may be aesthetically unacceptable to some.

Evaluation of Alternative 2 - Alternative 2 fulfills the planning objective of improving Lorain Harbor for navigation by Class X vessels. However, the annual benefits do not exceed the average annual costs. It is the policy of the Corps of Engineers not to recommend projects for implementation where costs for the project exceed the benefits that would be realized unless there are overriding considerations of environmental quality or social impacts warranting a departure from economic decisions. Alternative 2 does not exhibit any such overriding considerations. Therefore, since Alternative 2 does not exhibit economic efficiency, it could not be recommended for implementation and was not considered further.

ALTERNATIVE 3 (DIRECT DELIVERY WITH NEW MOVABLE ERIE AVENUE BRIDGE)

Description of Alternative 3 - Instead of replacement of the Erie Avenue Bridge with a high level structure (construction Item C), a new movable bridge at Erie Avenue would be constructed (construction Item D). All other construction items in this alternative are identical to Alternative 2. The necessary changes to the harbor and channel for this alternative are shown on Plate 8.

The existing bascule structure would be replaced by a lift bridge similar in style to the N&W railroad lift bridge that is upriver of Erie Avenue. The new lift bridge would have 370-foot clear span and a maximum height clearance of 125 feet for 1,000-foot vessels. Replacement of the Erie Avenue Bridge with a new movable bridge would minimize adverse impacts on traffic during construction and on relocation of residences. The new lift bridge would be located immediately upstream or downstream of the existing bridge. The lift bridge would have essentially identical functional characteristics and effects on traffic and land use as the existing structure. The principal permanent impact would be the presence of the lift bridge towers which would stand approximately 200 feet above the water.

Cost Estimate for Alternative 3 - The total estimated first cost for Alternative 3, including land acquisition, is $191.5 million. The total investment cost, including interest during construction, is $211.7 million and the total average annual charges are $17.3 million.

Economic Evaluation of Alternative 3 - Benefit categories included in this alternative are: (1) iron ore transportation savings, (2) future vessel launching costs avoided and (3) advance replacements. The total average annual benefit for Alternative 3 is $17,500,000. The net benefit is $200,000 and the B/C ratio is 1.01. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 19 below.

Table 19 - Summary of Benefits and Costs for Alternative 3 (1)

	Average Annual Charges	Average Annual Benefits	Net Average Annual Benefits	Benefit/Cost Ratio
	($ million/yr.)	($ million/yr.)	($ million/yr.)	
Total Project	17.3	17.5	0.2	1.01

(1) May 1980 price levels and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 3 - Instead of replacement of the Erie Avenue Bridge with a high level structure, a new movable bridge at Erie Avenue would be constructed. All other construction items in this alternative are identical to Alternative 2.

A lift bridge replacement at Erie Avenue would be more economical than the present bascule type. There would be little or no difference in the traffic

ALTERNATIVE 3 (DIRECT DELIVERY WITH NEW MOVABLE ERIE AVENUE BRIDGE)

Description of Alternative 3 - Instead of replacement of the Erie Avenue Bridge with a high level structure (construction Item C), a new movable bridge at Erie Avenue would be constructed (construction Item D). All other construction items in this alternative are identical to Alternative 2. The necessary changes to the harbor and channel for this alternative are shown on Plate 8.

The existing bascule structure would be replaced by a lift bridge similar in style to the N&W railroad lift bridge that is upriver of Erie Avenue. The new lift bridge would have 370-foot clear span and a maximum height clearance of 125 feet for 1,000-foot vessels. Replacement of the Erie Avenue Bridge with a new movable bridge would minimize adverse impacts on traffic during construction and on relocation of residences. The new lift bridge would be located immediately upstream or downstream of the existing bridge. The lift bridge would have essentially identical functional characteristics and effects on traffic and land use as the existing structure. The principal permanent impact would be the presence of the lift bridge towers which would stand approximately 200 feet above the water.

Cost Estimate for Alternative 3 - The total estimated first cost for Alternative 3, including land acquisition, is $191.5 million. The total investment cost, including interest during construction, is $211.7 million and the total average annual charges are $17.3 million.

Economic Evaluation of Alternative 3 - Benefit categories included in this alternative are: (1) iron ore transportation savings, (2) future vessel launching costs avoided and (3) advance replacements. The total average annual benefit for Alternative 3 is $17,500,000. The net benefit is $200,000 and the B/C ratio is 1.01. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 19 below.

Table 19 - Summary of Benefits and Costs for Alternative 3 (1)

	Average Annual Charges ($ million/yr.)	Average Annual Benefits ($ million/yr.)	Net Average Annual Benefits ($ million/yr.)	Benefit/Cost Ratio
Total Project	17.3	17.5	0.2	1.01

(1) May 1980 price levels and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 3 - Instead of replacement of the Erie Avenue Bridge with a high level structure, a new movable bridge at Erie Avenue would be constructed. All other construction items in this alternative are identical to Alternative 2.

A lift bridge replacement at Erie Avenue would be more economical than the present bascule type. There would be little or no difference in the traffic

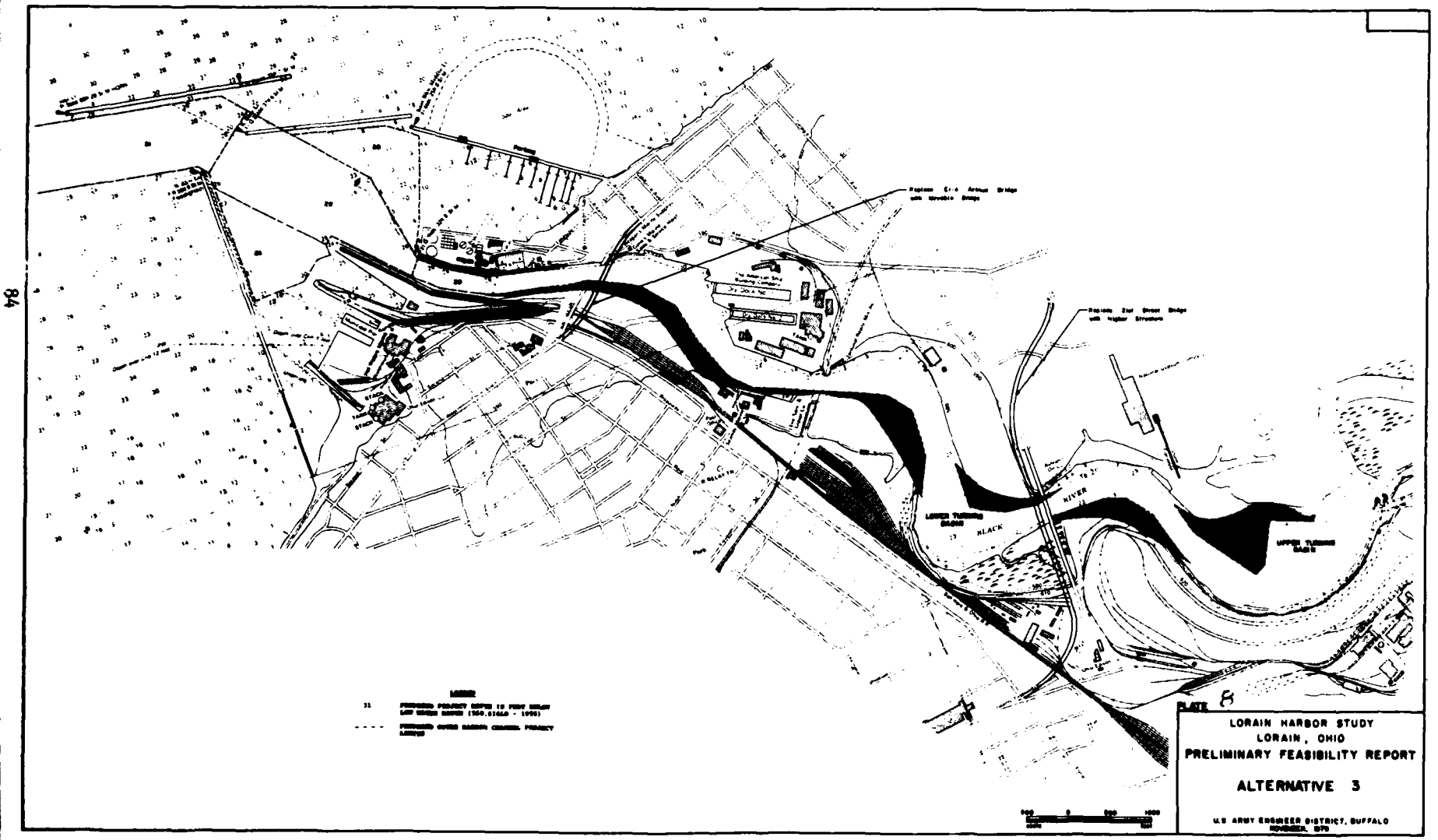


PLATE 8

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT

ALTERNATIVE 3

U.S. ARMY ENGINEER DISTRICT, BUFFALO

AD-A129 330 LORAIN HARBOR OHIO COMMERCIAL NAVIGATION STUDY VOLUME I 2/3
MAIN REPORT AND DRAFT ENVIRONMENTAL IMPACT STATEMENT
(U) CORPS OF ENGINEERS BUFFALO NY BUFFALO DISTRICT
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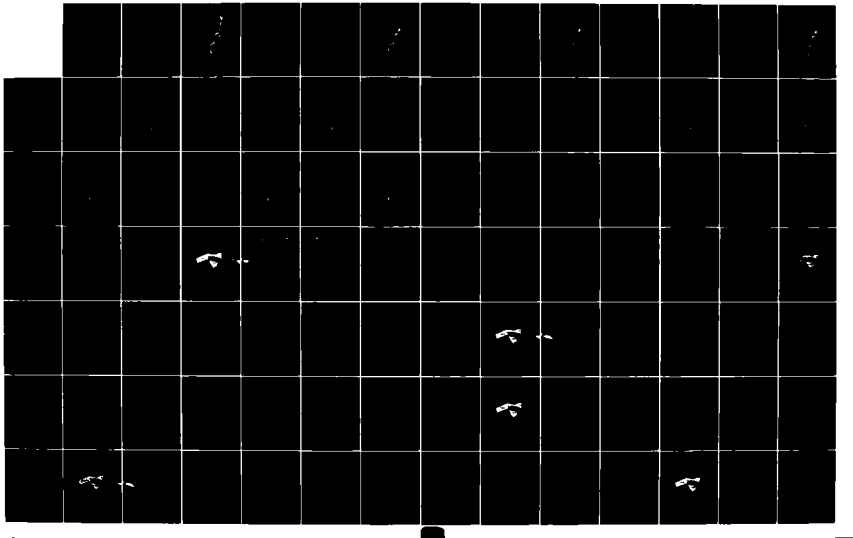

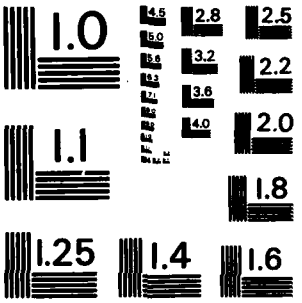

MICROCOPY RESOLUTION TEST CHART
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service provided by a lift bridge compared to a bascule. The existing bridge could remain operational during construction. There would be brief periods of traffic interference for pavement tie-in near the end of construction. Relatively little property would be required for construction.

When the existing bridge is removed, an approximately equal area of land would be freed for development and use as would be required for the new structure.

The lift bridge towers would be highly visible, but it is anticipated that there would be no major objection. They would be entirely within the industrial river corridor and the N&W Railroad Bridge upstream is the same type structure, establishing a precedent in the area.

In general, a lift bridge replacement for the existing Erie Avenue bascule span would effect no permanent changes from existing conditions. It would be essentially a functional "replacement-in-kind."

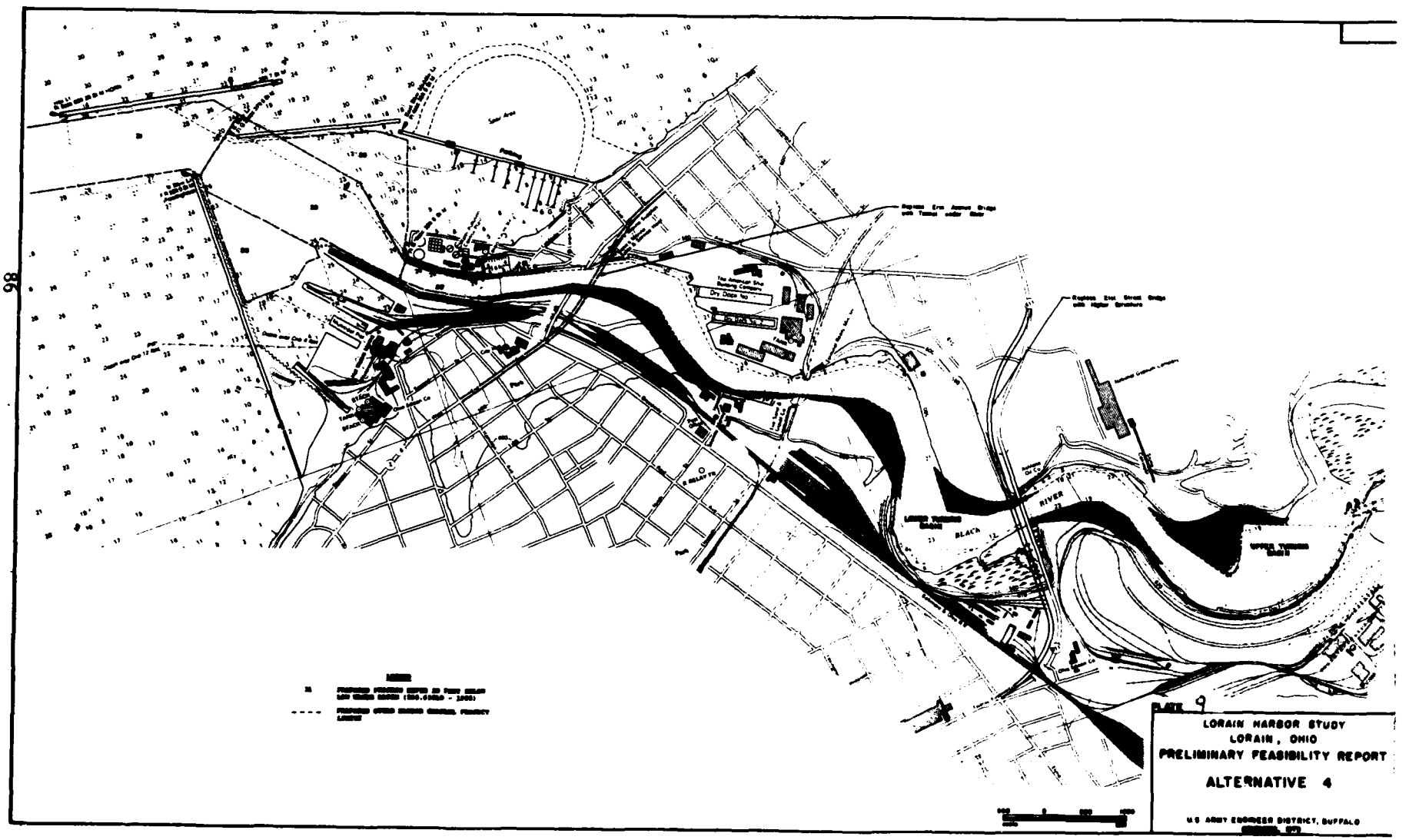
Evaluation of Alternative 3 - Alternative 3 fulfills the planning objective of improving Lorain Harbor for navigation by Class X vessels. The average annual benefits exceed the average annual cost. However, other alternatives in this study assure an efficient project operation as well as Alternative 3 and also have significantly higher net benefits. This alternative is among the highest cost alternatives and is one of the most disruptive of existing conditions. Therefore, Alternative 3 was not considered further.

ALTERNATIVE 4 (DIRECT DELIVERY WITH TUNNEL REPLACEMENT OF ERIE AVENUE BRIDGE)

Description of Alternative 4 - The only difference between this alternative and Alternatives 2 and 3 is again the option of replacing the Erie Avenue Bridge which would be replaced in this alternative by a tunnel under the Black River (construction Item E). Alternative 4 is shown on Plate 9.

The tunnel replacement for the existing Erie Avenue Bridge would have four 13-foot wide traffic lanes, two 2-1/2-foot wide emergency sidewalks and a 6-foot wide pedestrian passageway. The total tunnel length would be approximately 3,000 feet with 1,000 feet constructed under water. Tunnel portals would be aligned with Erie Avenue, with grade intersection at Hamilton Street to the south and near Delaware Street to the north. Some widening of Erie Avenue in these locations would be required. Crosstown traffic would travel substantially the same distance with fewer intersections. Local traffic would be adversely affected in varying degrees depending on the relation of the point of origin and designation to the tunnel entrances. Interruption of traffic for the passage of vessels on the river would be eliminated.

The existing bascule structure would remain in service until the tunnel was opened to traffic. Tunnel construction along Erie Avenue would require considerable long-term rerouting of traffic to other streets and a limited amount of temporary road construction at the approaches to the present bridge.


LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT
ALTERNATIVE 4
U.S. ARMY ENGINEER DISTRICT, BUFFALO

Cost Estimate for Alternative 4 - The total estimated first cost for Alternative 4, including land acquisition, is $255.0 million. The total investment cost, including interest during construction, is $282.0 million and the total average annual charges are $23.1 million.

Economic Evaluation of Alternative 4 - Benefit categories included in this alternative are: (1) iron ore transportation savings, (2) future vessel launching costs avoided, and (3) advance replacements. The total average annual benefit for Alternative 4 is $17,600,000. The net benefit is -$5,500,000 and the B/C ratio is 0.76. A summary of annual charges, annual beenfits, net benefits, and benefit-to-cost ratio is shown in Table 20 below.

Table 20 - Summary of Benefits and Costs for Alternative 4 (1)

	Average Annual Charges ($ million/yr.)	Average Annual Benefits ($ million/yr.)	Net Average Annual Benefits ($ million yr.)	Benefit/Cost Ratio
Total Project	23.1	17.6	-5.5	0.76

(1) May 1980 price levels and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 4 - The only difference in this alternative from Alternatives 2 and 3 is again the option of replacing the Erie Avenue Bridge, which would be replaced in this alternative by a tunnel under the river.

With a tunnel, crosstown traffic would travel substantially the same distance with fewer intersections. Local traffic would be adversely affected in varying degrees depending on the relation of the point of origin and destination to the tunnel entrances. Interruption of traffic for the passage of vessels on the river would be eliminated.

The existing bascule structure would remain in service until the tunnel was opened to traffic. Tunnel construction along Erie Avenue would require considerable long-term rerouting of traffic to other streets and a limited amount of temporary road construction at the approaches to the present bridge. Upon completion, the tunnel would be mostly invisible with minimal permanent impact on surface activities and facilities.

Evaluation of Alternative 4 - Alternative 4 fulfills the planning objective of improving Lorain Harbor for navigation by Class X vessels. However, the annual benefits do not exceed the average annual costs. It is the policy of the Corps of Engineers not to recommend projects for implementation where costs for the project exceed the benefits that would be realized unless there are overriding considerations of environmental quality or social impacts warranting a departure from economic justification. Alternative 4 does not exhibit any such overriding considerations. Therefore, since Alternative 4 does not exhibit economic efficiency it was not considered further.

ALTERNATIVE 5 (PARTIAL TRANSSHIPMENT WITH RIVERSIDE PARK CUT)

Description of Alternative 5 - This alternative would include improvements which allow navigation of 1,000-foot vessels to the Lower Turning Basin and construction of a transshipment conveyor facility below 21st Street. Alternative 5 is shown on Plate 10.

Outer Harbor navigation improvements and a new channel cut through Riverside Park would be the same as in Alternative 1. Channel enlargement upriver from the Riverside Park Cut would be required, but only to below the 21st Street Bridge. The east bank at the Lower Turning Basin would be enlarged (Construction Item G) to provide easier turning maneuverability for the larger vessels.

The major feature of this alternative would be the construction of a transshipment facility located on the east bank of the Black River just below the 21st Street Bridge (Construction Item J). The facility would employ a belt-conveyor system (Construction Item K) to complete the transfer of material upriver. A bridge spanning the Black River would be required to convey material to the U.S. Steel Lorain Works located on the west bank of the river. The total length of the belt-conveyor required would be approximately 4,000 feet.

Cost Estimate for Alternative 5 - The total estimated first cost for Alternative 5, including land acquisition, is $99.1 million. The total investment cost, including interest during construction, is $106.1 million and the total average annual charges are $8.8 million.

Economic Evaluation of Alternative 5 - Benefit categories included in this alternative are: (1) iron ore transportation savings, and (2) future vessel launching costs avoided. The total average annual benefit for Alternative 5 is $15,900,000. The net benefit is $7,100,000 and the B/C ratio is 1.80. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 21.

Table 21 - Summary of Benefits and Costs for Alternative 5 (1)

	Average Annual Charges ($ million/yr.)	Average Annual Benefits ($ million/yr.)	Net Average Annual Benefits ($ million/yr.)	Benefit/Cost Ratio
Total Project	8.8	15.9	7.1	1.80

(1) May 1980 price levels and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 5 - This alternative, the first of the "navigation to the Lower Turning Basin" concepts, features a new channel through Riverside Park, Outer Harbor navigation improvements including the Inner Harbor Breakwater to protect the small-boat marina, and channel

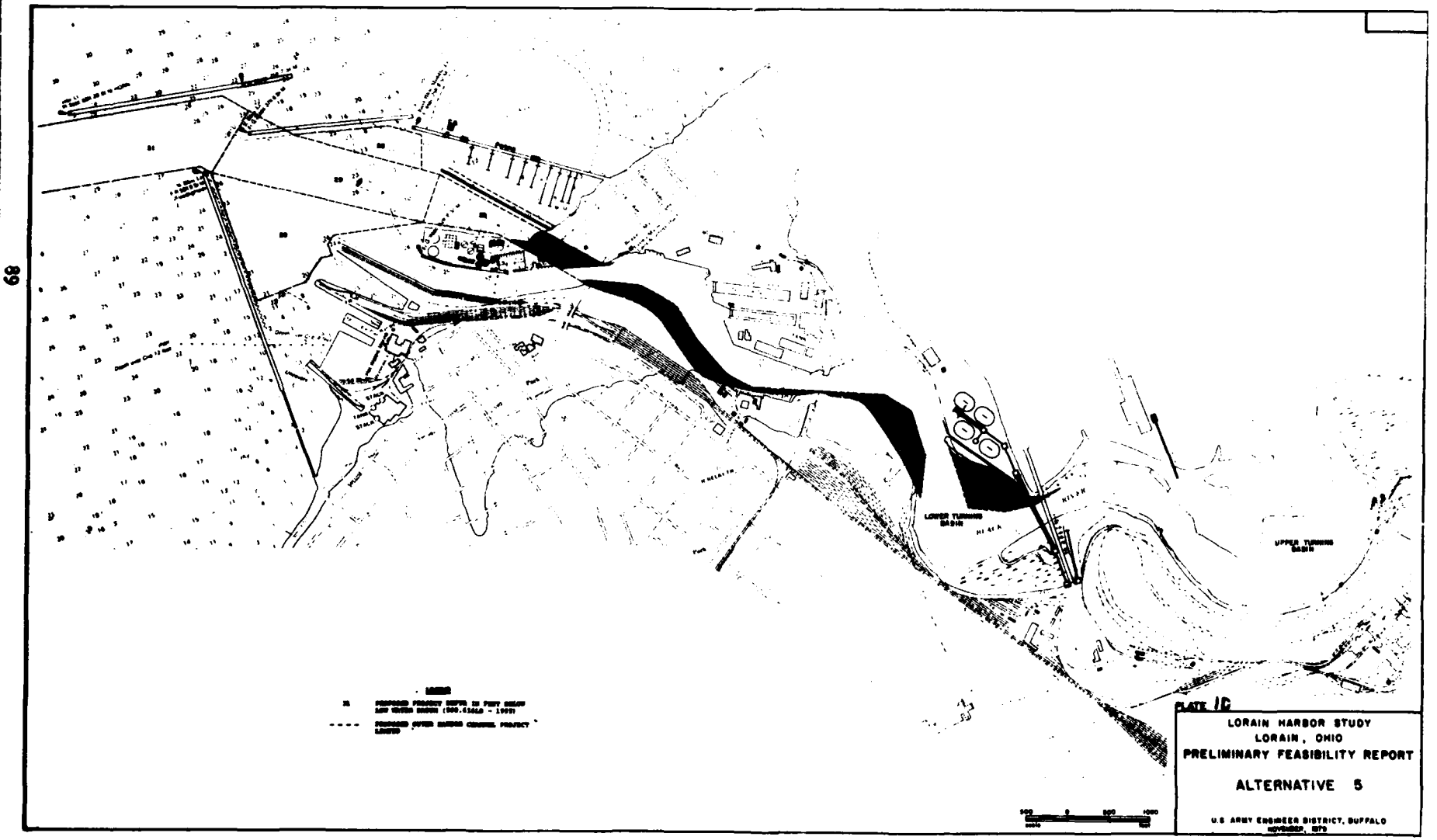


PLATE 1C

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT

ALTERNATIVE 5

U.S. ARMY ENGINEER DISTRICT, BUFFALO
NOVEMBER, 1979

enlargement all as discussed in Alternatives 1-4. Channel enlargement, however, would only be to below the 21st Street Bridge.

Enlarging the east bank at the Lower Turning Basin would provide easier turning maneuverability for the larger vessels negotiating a 180 degree turn to head downriver.

The amount of land in acres that would be converted to very deep, low quality aquatic habitat via bank cuts under this alternative is as follows.

Bank Cut	Acres
(Riverside Park) A	5.40
C-2	15.27
C-1	5.20
D	12.51
E-1	6.54
E-2	10.79

According to FWS (see Appendix F), implementation of this alternative would result in the loss of 12.5 acres of wooded habitat in Cut D. The rest of the proposed bank cuts involve areas that have very limited wildlife values because of prior commercial development. The wooded area in Cut D presently supports a number of small mammals and songbirds that would be forced to move to nearby habitat if the bank cut is made.

Implementation of this alternative would involve the elimination of approximately one-third of the shallow water habitat remaining in the Inner Harbor. Approximately 2,500 feet of the proposed bank cuts would be bulkheaded. Many of the fish species persisting in the Inner Harbor are dependent on the remaining shallow water areas and the limited cover provided therein. If spawning is occurring in this section of the river, in spite of the water quality degradation, it is probably occurring in the shallow water areas.

A transshipment facility would provide adequate berthing for the vessel sizes under study, temporary onshore storage of material in open stockpiles, and a transportation system for moving the material upriver. This alternative would provide for direct shipment to 21st Street and transshipment by conveyor to the steel plant.

The site chosen for the transshipment facility is presently owned by the N&W Railroad. Since this is commercial/industrial land, no major impact is expected. There would be noise and dust associated with construction and operation of the facility as well as the unsightliness of the cargo stockpiles. However, in an industrial area such as this, these impacts should be negligible.

The impacts of the conveyor system should also be minimal due to its short length (4,000 feet) and its location in an industrial section of the city. The conveyor would begin on N&W Railroad property, cross the river, and terminate on U.S. Steel property. Impacts would probably be limited to noise and dust, however, the land would be used more intensively. Direct shipment to 21st Street in Class X vessels and transshipping to U.S. Steel would conserve vessel fuel oil. Since the conveyor would be above ground, it may have a negative aesthetic impact, especially where it crosses the river.

Evaluation of Alternative 5 - Alternative 5 fulfills the planning objective of improving Lorain Harbor for navigation by Class X vessels and the annual benefits exceed the average annual cost (B/C > 1). However, other alternatives in this study assure an efficient project operation as well as Alternative 5 and also have higher net benefits. This alternative is a higher cost alternative than some other alternatives studied that have higher net benefits. Implementation of the plan would disrupt existing conditions to a greater extent than some others. Therefore, Alternative 5 was not considered further.

ALTERNATIVE 6 (PARTIAL TRANSSHIPMENT WITH NEW HIGH-LEVEL ERIE AVENUE BRIDGE)

Description of Alternative 6 - This alternative would be the same as Alternative 2 except for constructing a transshipment facility (construction Item J) and conveyor (Item K) at the 21st Street Bridge instead of enlarging the Upper Turning Basin (Item H) and replacing the 21st Street Bridge (Item I). Also included in this alternative are the same channel enlargement cuts, excluding the Riverside Park Cut; improvements to the Lower Turning Basin and transshipment conveyor facility as in Alternative 5. Construction items included in this alternative are shown on Plate 11.

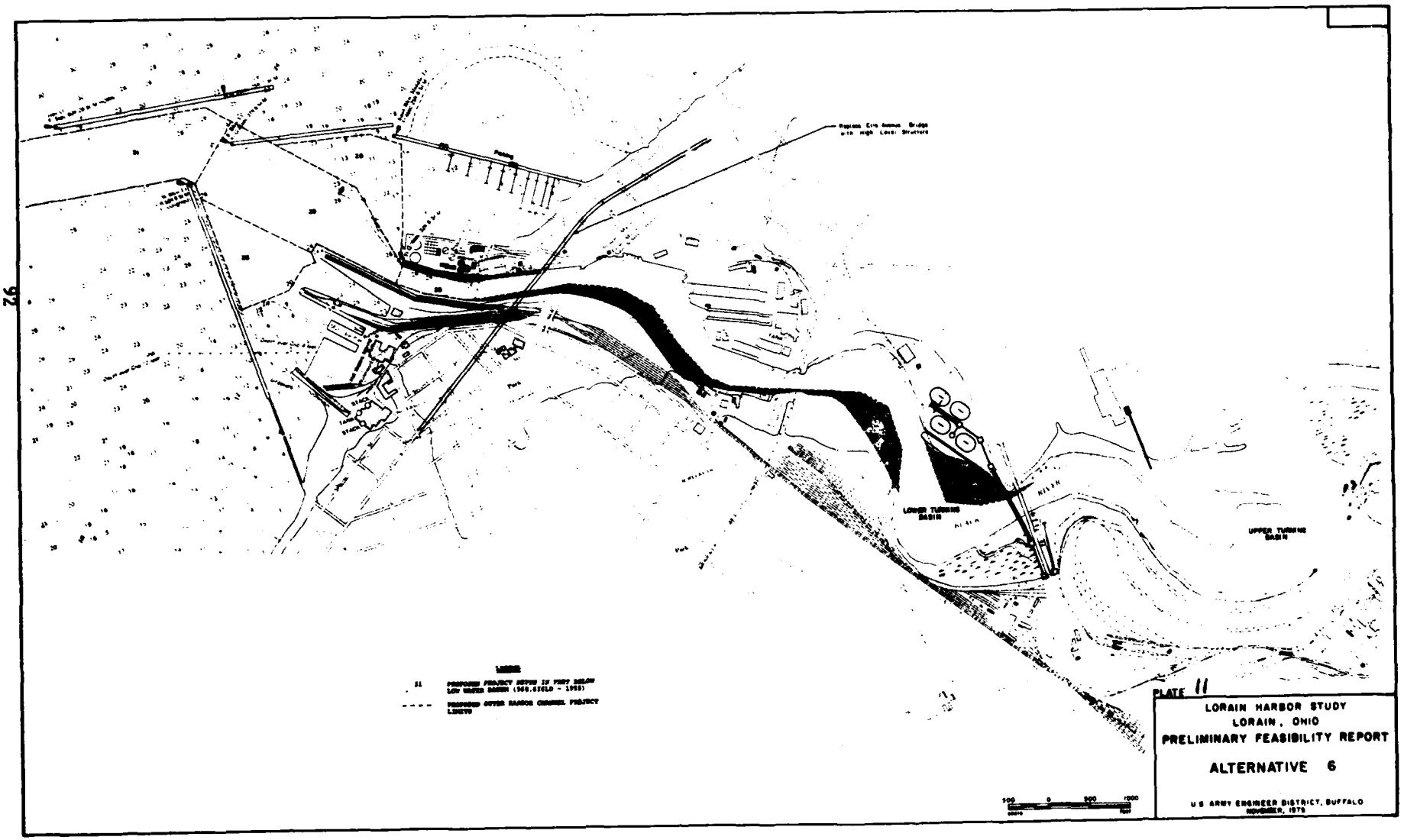
Cost Estimate for Alternative 6 - The total estimated first cost for Alternative 6, including land acquisition, is $149.0 million. The total investment cost, including interest during construction, is $164.5 million and the total average annual charges are $13.6 million.

Economic Evaluation of Alternative 6 - Benefit categories included in this alternative are: (1) iron ore transportation savings, (2) future vessel launching costs avoided, and (3) advance replacements. The total average annual benefit for Alternative 6 is $16,000,000. The net benefit is $2,400,000 and the B/C ratio is 1.18. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 22 below.

Table 22 - Summary of Benefits and Costs for Alternative 6 (1)

	Average Annual Charges ($ million/yr.)	Average Annual Benefits ($ million/yr.)	Net Average Annual Benefits ($ million/yr.)	Benefit/Cost Ratio
Total Project	13.6	16.0	2.4	1.18

(1) May 1980 price levels and 7-3/8 percent interest rate.


LOWER TURNING BASIN
UPPER TURNING BASIN
PLATE 11
LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT
ALTERNATIVE 6
U.S. ARMY ENGINEER DISTRICT, BUFFALO
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Environmental Features/Assessment of Plan 6 - The features of this alternative have been previously discussed as follows:

Enlarge or Reorient Outer Harbor Entrance	- Alternatives 1 & 2
Replace Erie Avenue Bridge with a Higher Structure	- Alternative 2
Enlarge Channel	- Alternative 5
Enlarge Lower Turning Basin	- Alternative 5
Construct Conveyor Transfer Facility Below 21st Street	- Alternative 5
Construct Conveyor System Upriver from 21st Street	- Alternative 5

Evaluation of Alternative 6 - Alternative 6 fulfills the planning objective of improving Lorain Harbor for navigation by Class X vessels and the annual benefits exceed the average annual cost (B/C > 1); however, other alternatives studied also provide an efficient project operation and have significantly higher net benefits. Alternative 6 is also a higher cost alternative than some of the other alternatives studied, and it also disrupts existing conditions to a greater extent than some of the others. Therefore, Alternative 6 was not considered further.

ALTERNATIVE 7 (PARTIAL TRANSSHIPMENT WITH NEW MOVABLE ERIE AVENUE BRIDGE)

Description of Alternative 7 - This alternative would be identical to Alternative 6 in all ways except that the Erie Avenue Bridge would be replaced with a movable bridge. This bridge would have the same features as the new Erie Avenue Bridge described in Alternative 3. Construction items included in this alternative are shown in Plate 12.

Cost Estimate for Alternative 7 - The total estimated first cost for Alternative 7, including land acquisition, is $120.0 million. The total investment cost, including interest during construction, is $132.7 million and the total average annual charges are $11.1 million.

Economic Evaluation of Alternative 7 - Benefit categories included in this alternative are: (1) iron ore transportation savings, (2) future vessel launching costs avoided, and (3) advance bridge replacements. The total average annual benefit for Alternative 7 is $16,000,000. The net benefit is $4,900,000 and the B/C ratio is 1.44. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 23 below.

Table 23 - Summary of Benefits and Costs for Alternative 7 (1)

	Average Annual Charges ($ million/yr.)	Average Annual Benefits ($ million/yr.)	Net Average Annual Benefits ($ million/yr.)	Benefit/Cost Ratio
Total Project	11.1	16.0	4.9	1.44

(1) May 1980 price levels and 7-3/8 percent interest rate.

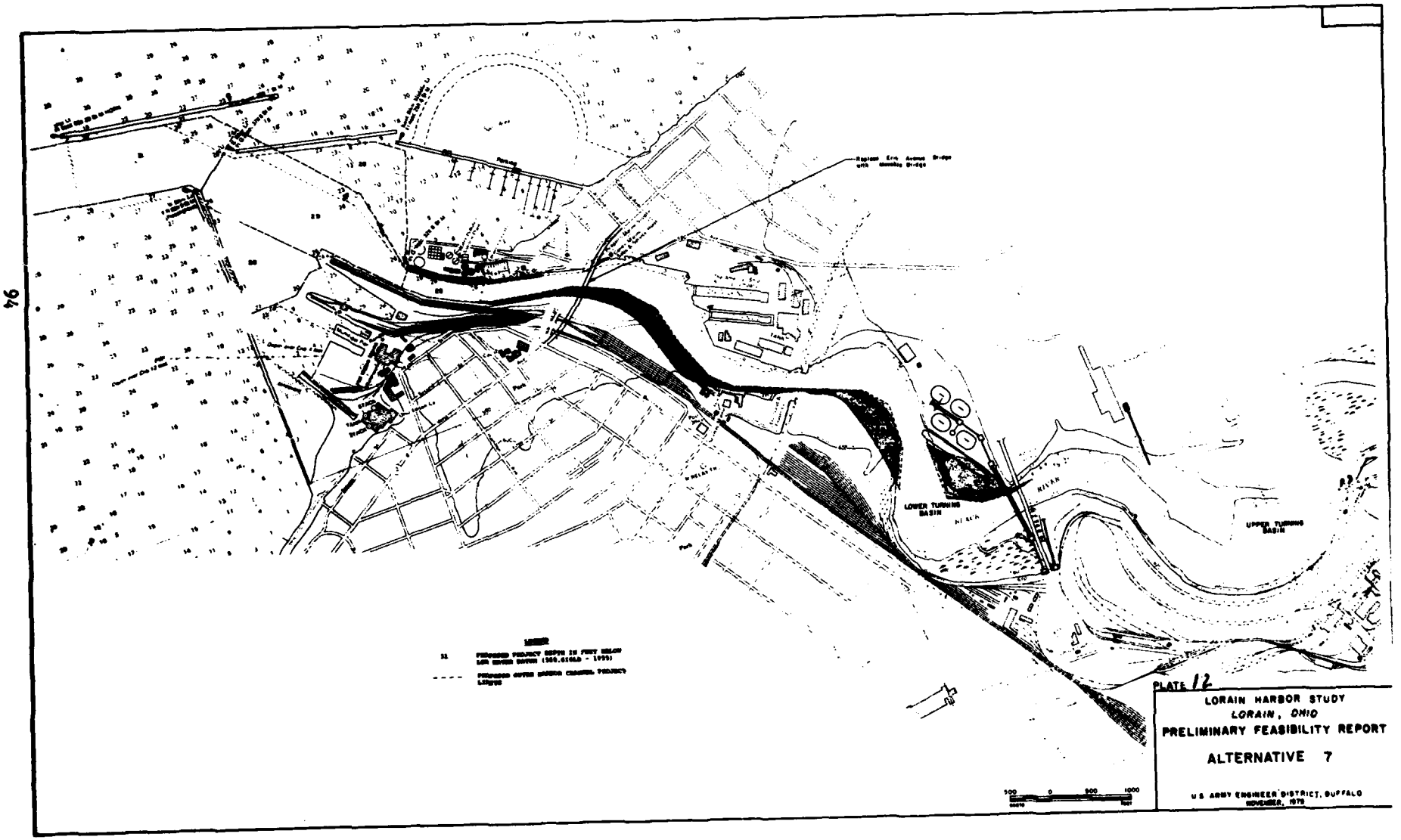

PLATE 12

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT

ALTERNATIVE 7

U.S. ARMY ENGINEER DISTRICT, BUFFALO
NOVEMBER, 1979

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Environmental Features/Assessment of Plan 7 - The environmental effects of Alternative 7 would be identical to Alternative 6, except the Erie Avenue Bridge (Construction Item C for Alternative 6) would be replaced with a new movable bridge (Construction Item D). The impacts for the movable bridge were previously discussed for Alternative 3.

Evaluation of Alternative 7 - Alternative 7 fulfills the planning objective of improving Lorain Harbor for navigation by Class X vessels and the average annual benefits exceed the average annual costs (B/C > 1); however, since some other alternatives studied meet the navigation objective, assure an efficient project operation, are less costly to construct than Alternative 7, have significantly higher net benefits, and are less disruptive to the community, Alternative 7 was not considered further.

ALTERNATIVE 8 (PARTIAL TRANSSHIPMENT WITH TUNNEL REPLACEMENT OF ERIE AVENUE BRIDGE)

Description of Alternative 8 - This alternative is identical to Alternatives 6 and 7 except that the Erie Avenue Bridge would be replaced with a tunnel under the Black River (construction Item E). The tunnel would have the same features as the tunnel described in Alternative 4. Construction items included in this alternative are shown in Plate 13.

Cost Estimate for Alternative 8 - The total estimated first cost for Alternative 8, including land acquisition, is $183.5 million. The total investment cost, including interest during construction, is $196.5 million and the total average annual charges are $16.4 million.

Economic Evaluation of Alternative 8 - Benefit categories included in this alternative are: (1) iron ore transportation savings, (2) future vessel launching costs avoided, and (3) advance replacements. The total average annual benefit for Alternative 8 is $16,100,000. The net benefit is -$300,000 and the B/C ratio is 0.98. A summary of average annual charges, average annual benefits, net average annual benefits, and benefit-to-cost ratio is shown in Table 24 below.

Table 24 - Summary of Benefits and Costs for Alternative 8 (1)

	Average Annual Charges ($ million/yr.)	Average Annual Benefits ($ million/yr.)	Net Average Annual Benefits ($ million/yr.)	Benefit/Cost Ratio
Total Project	16.4	16.1	- .3	0.98

(1) May 1980 price levels and 7-3/8 percent interest rate.

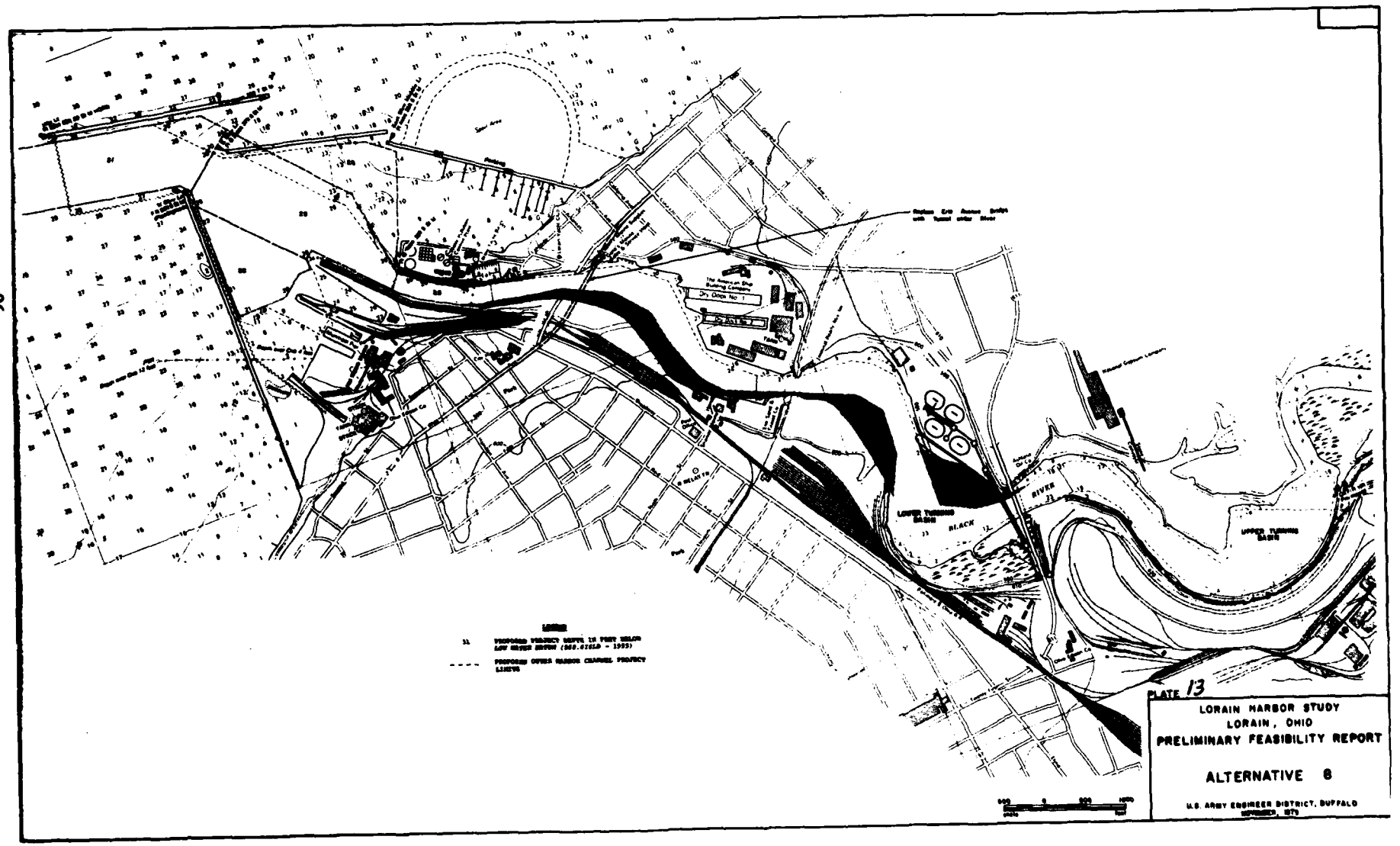


PLATE 13
LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT
ALTERNATIVE 8
U.S. ARMY ENGINEER DISTRICT, BUFFALO
BLACK
RIVER

Environmental Features/Assessment of Plan 8 - The features of this alternative have been previously discussed as follows:

Enlarge or Reorient Outer Harbor Entrance	- Alternatives 1 & 2
Replace Erie Avenue Bridge with Tunnel under River	- Alternative 4
Enlarge Channel	- Alternative 5
Enlarge Lower Turning Basin	- Alternative 5
Construct Conveyor Transfer Facility Below 21st Street	- Alternative 5
Construct Conveyor System Upriver from 21st Street	- Alternative 5

Evaluation of Alternative 8 - Alternative 8 fulfills the planning objective of improving Lorain Harbor for navigation by Class X vessels. However, the annual benefits do not exceed the average annual costs. It is the policy of the Corps of Engineers not to recommend projects for implementation where costs for the project exceed the benefits that would be realized unless there are overriding considerations of environmental quality or social impacts warranting a departure from economic decisions. Alternative 8 does not exhibit any such overriding considerations. Therefore, since Alternative 8 does not exhibit economic efficiency, it cannot be recommended for implementation.

INTRODUCTION TO "TRANSSHIPMENT FROM LAKEFRONT" ALTERNATIVES

The preceding eight alternatives would provide for movement of iron ore in 1,000-foot vessels directly to the U.S. Steel plant on the Black River (Alternatives 1 through 4) or upriver to the 21st Street Bridge in 1,000-footers and transshipment therefrom to the U.S. Steel plant (Alternatives 5 through 8). As was shown during the discussion of these eight alternatives, navigation improvements on the Black River would be very expensive and not highly cost effective.

In an attempt to reduce the project first costs, a range of alternatives that would provide access to the lakefront harbor for 1,000-foot vessels and transshipment upriver by various modes were also evaluated. Four of these alternatives (Alternatives 9 through 12) would provide improvements to the harbor entrance for delivery of iron ore in 1,000-foot vessels to a lakefront transshipment facility and then to the U.S. Steel plant by conveyor, special purpose vessel, train, or truck for Alternatives 9 through 12, respectively. Alternatives 13 through 16 would incorporate the same features as Alternatives 9 through 12, and would also include improvements at the mouth of the Black River to Erie Avenue Bridge for 1,000-footers at the AmShip facility. Alternatives 9 through 16 are discussed below.

ALTERNATIVE 9 (LAKEFRONT TRANSSHIPMENT - CONVEYOR UPRIVER)

Description of Alternative 9 - This is one of several alternatives that would provide for movement of iron ore upriver to the U.S. Steel plant from a transshipment facility capable of accommodating 1,000-foot vessels, located immediately westerly of the mouth of the Black River. This alternative would improve harbor entrance conditions to permit safe and efficient operation of

1,000-foot vessels to the lakefront, and provide a transshipment facility for delivery of iron ore to U.S. Steel by conveyor. Construction items included in this alternative are shown on Plate 14.

Lakefront navigation improvements would include maintaining the existing river channel entrance, removing a 600-foot section of the East Breakwater, and lengthening by 600 feet the Outer Breakwater (Construction Item A). The Outer Harbor area would be deepened by approximately 3 feet.

This alternative would use an existing but inactive coal slip for the berthing area for the transshipment facility. This area of the Outer Harbor is sufficient to accommodate the transshipment facility for Alternative 9 and the Lakefront transshipment facility recently constructed by Republic Steel Corporation that serves its Cleveland and hinterland plants. The east pier of the coal slip, selected as the wharf for the proposed transshipment facility (Construction Item L) would require renovation and structural modifications to render it suitable for a docking facility. The coal slip area would also require dredging to enable berthing of 1,000-foot vessels. For this alternative, a conveyor system would be used to transport the off-loaded iron ore upriver to the U.S. Steel Plant (Construction Item M). The system would be fed by a dock hopper constructed on the east pier which would receive the shipments and direct the material flow to a transfer station for subsequent routing to a storage area or direct movement upriver. Approximately 1,500 lineal feet of enclosed conveyor construction would be required to bypass Republic's pellet storage piles and 30 lineal feet of tunnel would be necessary to pass a below-grade rail crossing. The conveyor system would meander upriver, pass beneath the approach ramp to the 21st Street Bridge, and terminate at U.S. Steel. Elevated structures would be required to bridge East Ninth Street and the N&W Railroad tracks. The conveyor would be enclosed for safety and to diminish noise and air pollution. Dust collection systems would be provided at transfer points.

Cost Estimate for Alternative 9 - The total estimated first cost of principal project features for Alternative 9, including land acquisition, is $60.2 million. The total investment cost, including interest during construction, is $64.5 million and the total average annual charges are $5.7 million.

Economic Evaluation of Alternative 9 - The only benefit category applicable to this alternative is iron ore transportation savings. The total average annual benefit for Alternative 9 is $15,800,000. The net benefit is $10,100,000 and the B/C ratio is 2.78. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 25 below.

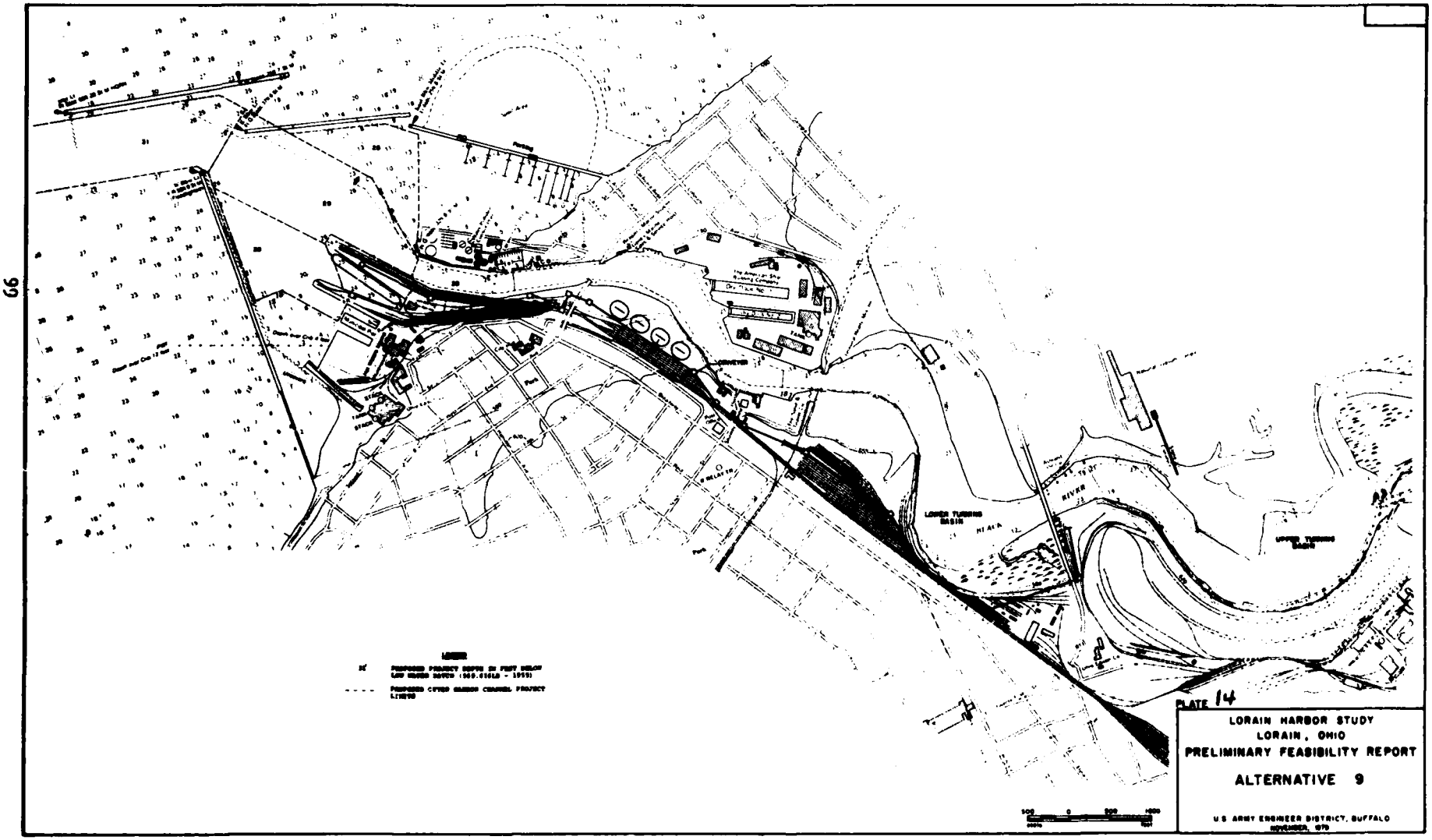


PLATE 14
LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT
ALTERNATIVE 9
U.S. ARMY ENGINEER DISTRICT, BUFFALO
NOVEMBER, 1979

Table 25 - Summary of Benefits and Costs for Alternative 9 (1)

	Average Annual Charges ($ million/yr.)	Average Annual Benefits ($ million/yr.)	Net Average Annual Benefits ($ million/yr.)	Benefit/Cost Ratio
Total Project	5.7	15.8	10.1	2.78

(1) May 1980 price levels, and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 9 - With this alternative, the Outer Harbor would be improved as discussed in Alternatives 1 and 2.

This is the first of the alternatives which would provide for navigation to the lakefront and transshipment upriver to U.S. Steel. These alternatives would result in a minimal saving of fuel oil, since vessels would not have to make their way up the 3-mile river channel to U.S. Steel.

A lakefront transshipment facility would use an existing, inactive coal slip as a berthing area. Renovation and structural modifications would be required. No major impacts are expected. The conveyor system meandering upriver to U.S. Steel from the coal dock immediately west of the mouth of the Black River would pass through primarily commercial and industrial land; therefore, environmental impacts would be minimal. The conveyor would require elevated structures to bridge across East 9th Street and to bridge over the N&W Railroad tracks. This could create a negative aesthetic impact, since the conveyor would be in plain view. At ground level, the conveyor would be enclosed by a prefabricated metal building for safety and to diminish noise and air pollution. Dust collection systems would be provided at each transfer point.

Evaluation of Alternative 9 - Alternative 9 is a lakefront transshipment alternative. It involves the construction of a lakefront transshipment facility and an upriver conveyor system. This alternative has the second highest net benefits ($10,100,000) and the second best benefit-to-cost ratio (2.78) of any of the alternatives investigated.

Construction of a transshipment facility and any means of upriver transshipment would be the responsibility of local interests and no attempt was made to determine what upriver transshipment mode should be utilized. The analysis performed does show lakefront transshipment to be the most economically efficient concept (maximum net benefits and greatest B/C ratios), and the four transshipment alternatives investigated (Alternatives 9-12) all appear to be environmentally, financially, and institutionally feasible. Which of those four alternatives that should be considered in greater detail in the final stage of study was discussed with local officials and industry representatives at a workshop held at the start of the final stage.

This alternative would require the acquisition of land or rights-of-way for the conveyor for the 3-mile length of the Black River. It would also require modifications to U.S. Steel's present method of receipt of iron ore.

It was concluded that Alternative 9 warrants further consideration as the selected plan for commercial navigation improvements, contingent upon the expressed desire of local interests. Therefore, Alternative 9 was presented, along with Alternatives 10, 11, and 12, to workshop participants as one of the possible alternatives to be investigated in greater detail. Local interests did desire further consideration of Alternative 9 and it is carried into this Final Feasibility investigation.

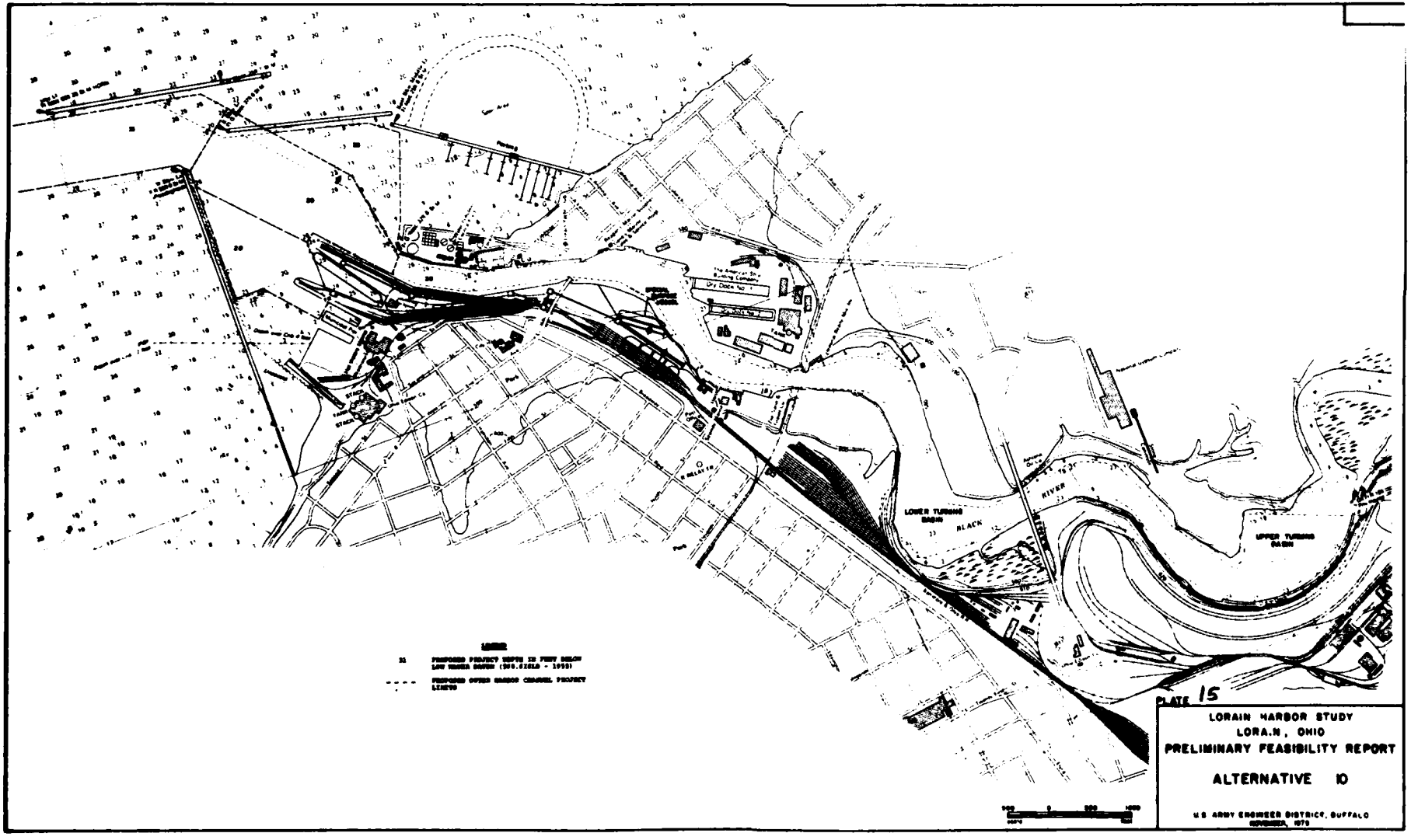
ALTERNATIVE 10 (LAKEFRONT TRANSSHIPMENT - VESSEL UPRIVER)

Description of Alternative 10 - This alternative would be identical to Alternative 9 in all ways but one. In lieu of the conveyor system (Construction Item M), an upriver special purpose vessel facility would be constructed (Construction Item N). The special purpose vessel would be a highly maneuverable craft suitable for river navigation as well as open-lake navigation. This self-unloading vessel would have a cargo capacity of approximately 20,000 tons. The berthing facility for this vessel would be constructed on the west bank of the Black River just upstream from Erie Avenue. A turning basin would also be constructed at this point to enable the vessel to turn around.

The facility would include a ship loader which would be capable of loading the special purpose vessel at a rate of 2,500 tons per hour. Conveyors between the Lakefront transshipment area and the special purpose vessel facility would be constructed. To meet the annual anticipated iron ore requirement by U.S. Steel, the special purpose vessel would need to operate 16 hours per day, 6 days a week for the duration of the shipping season. Construction items included in this alternative are shown in Plate 15.

Cost Estimate for Alternative 10 - The total estimated first cost for Alternative 10, including land acquisition, is $51.4 million; the total investment cost, including interest during construction, is $55.0 million; and the total average annual charges are $4.9 million.

Economic Evaluation of Alternative 10 - The benefit category included in this alternative is iron ore transportation savings. The total average annual benefit for Alternative 10 is $12,300,000. The net benefit is $7,400,000 and the benefit/cost ratio is 2.51. A summary of annual charges,


LOWER TURNING BASIN
BLACK
RIVER
UPPER TURNING BASIN
PLATE 15
LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT
ALTERNATIVE 10
U.S. ARMY ENGINEER DISTRICT, BUFFALO

annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 26 below.

Table 26 - Summary of Benefits and Costs for Alternative 10 (1)

	Average Annual Charges ($ million per year)	Average Annual Benefits ($ million per year)	Net Average Annual Benefits ($ million per year)	Benefit/Cost Ratio
Total Project	4.9	12.3	7.4	2.51

(1) May 1980 price levels and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 10 - This alternative would be identical to Alternative 9 in all ways but one. In lieu of the conveyor system, an upriver special purpose vessel facility would be constructed.

A berthing facility would be constructed for the special purpose vessel on the west bank of the Black River, just upstream from Erie Avenue. The channel would be widened in this area to permit the vessel to turn around without having to enter the Outer Harbor. This would result in land being converted to relatively low quality aquatic habitat. This land is presently owned by Republic Steel, is vacant, and sparsely vegetated. Therefore, impacts should be minimal.

Placing the stockpiles upstream from Erie Avenue and west of the special purpose berthing facility would require the removal of 6,500 linear feet of railroad trackage.

Using a special purpose vessel to transport cargo to U.S. Steel would not significantly affect the natural environment since commercial craft already navigate the Federally-maintained river.

Evaluation of Alternative 10 - Alternative 10 is a lakefront transshipment alternative that involves the construction of the lakefront transshipment facility and utilization of a "special purpose vessel" for upriver delivery. This alternative is economically justified, and has net benefits of $7,400,000 and benefit/cost ratio of 2.51 which are among the highest of any of the alternatives.

Construction of a transshipment facility and any means of upriver transshipment would be the responsibility of local interests. Therefore, this report does not attempt to determine what upriver transshipment mode should be utilized. The analysis performed does show lakefront transshipment to be the most economically efficient concept (maximum net benefits and greatest benefit/cost ratios) and the four transshipment schemes investigated (Alternatives 9-12) all appear to be environmentally, socially, financially, and institutionally feasible. This alternative was discussed with local officials and industry representatives at a workshop, and it was requested that this alternative be considered further in the detailed stage of study.

This alternative would not require as much land acquisition as the three other lakefront transshipment alternatives due to utilization of the existing waterway. It also would not require U.S. Steel to modify its present method of iron ore receipt.

It was concluded that Alternative 10 warranted further consideration as the selected plan for commercial navigation improvements, contingent upon the expressed desires of local interests.

ALTERNATIVE 11 (LAKEFRONT TRANSSHIPMENT - RAIL UPRIVER)

Description of Alternative 11 - This alternative is identical to Alternative 10 except that in lieu of a special purpose vessel (Construction Item N), material would be shipped upriver from the conveyor system hopper via the existing rail system (Construction Item O). Construction items in this alternative are shown on Plate 16.

The rail car loading facility would be located upstream of the Erie Avenue Bridge and fed by a conveyor system from the lakefront transshipment facility. The rail car loader would be a surge-bin type hopper capable of flood-loading the rail cars. The hopper cars would have a cargo capacity of 100 tons each. The material could be moved upriver by 50 car unit trains. To move the maximum forecasted flow of material would require two unit trains operating simultaneously 24 hours per day, 5 days a week for the duration of the shipping season by the end of the project planning period. Cycle time for loading and delivery upriver is estimated to be 4 hours. While there is existing trackage, the rail lines would require upgrading in order to carry the anticipated loads.

Cost Estimate for Alternative 11 - The total estimated first cost for Alternative 11, including land acquisition, is $38.4 million; the total investment cost, including interest during construction, is $41.0 million; and the total average annual charges are $3.8 million.

Economic Evaluation of Alternative 11 - The only benefit category applicable to this alternative is iron ore transportation savings. The total average annual benefit for Alternative 11 is $14,900,000. The net benefit is $11,100,000 and the benefit/cost ratio is 3.91. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 27 below.

Table 27 - Summary of Benefits and Costs for Alternative 11 (1)

	Average Annual Charges ($ million per year)	Average Annual Benefits ($ million per year)	Net Average Annual Benefits ($ million per year)	Benefit/Cost Ratio
Total Project	3.8	14.9	11.1	3.91

(1) May 1980 price levels and 7-3/8 percent interest rate.

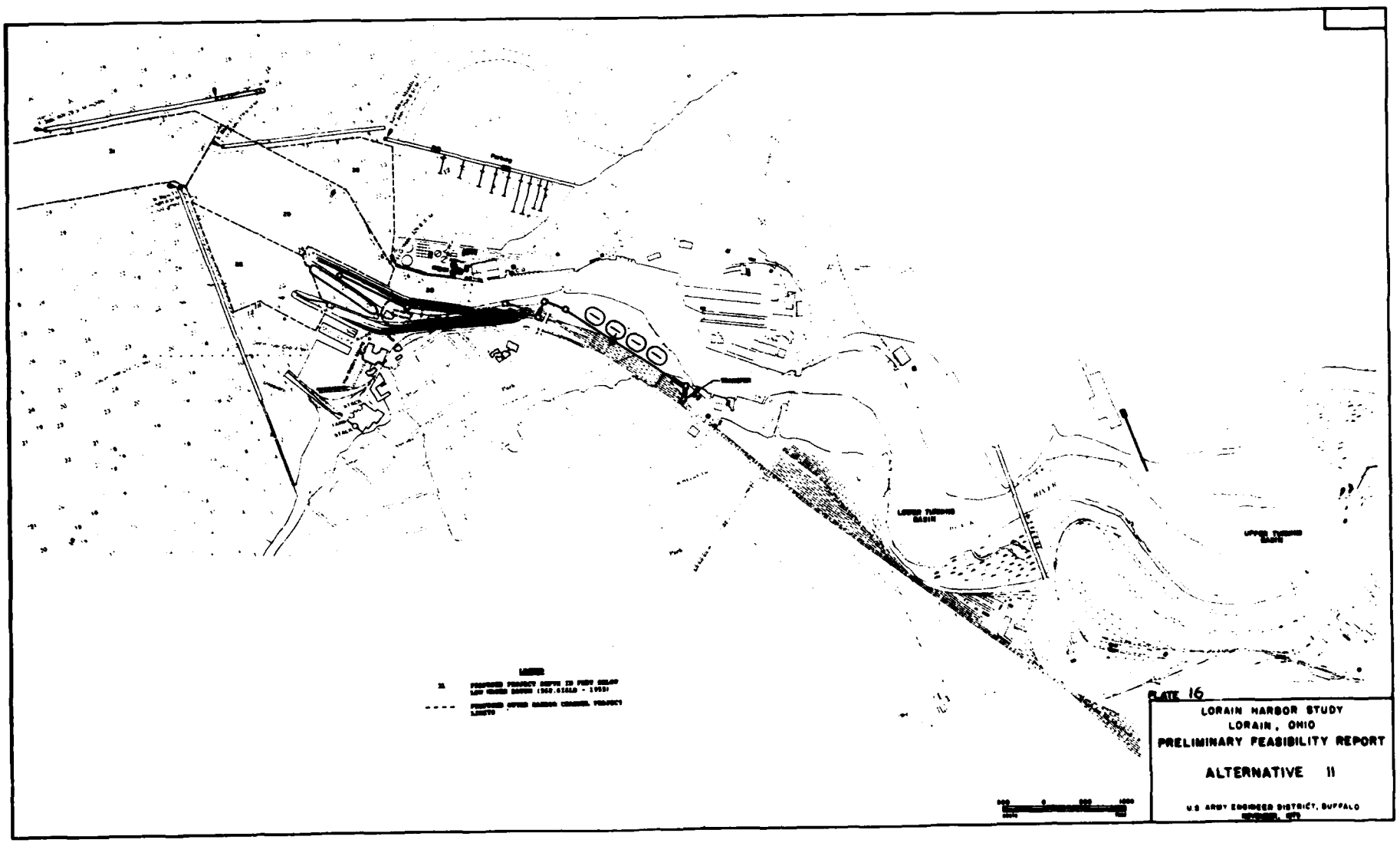


PLATE 16

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT

ALTERNATIVE II

U.S. ARMY ENGINEER DISTRICT, BUFFALO

Environmental Features/Assessment of Plan 11 - This alternative is identical to Alternatives 9 and 10, featuring enlarging or reorienting the Outer Harbor entrance and construction of a transshipment facility at the lakefront, except that in lieu of a conveyor system (Alternative 9) or the special purpose vessel (Alternative 10), material could be shipped upriver via the existing rail system.

Upgrading of existing trackage would be required to facilitate rail shipments to U.S. Steel. Sufficient land area is not available to provide loop rail trackage at each end of the rail system. Train movements would have to move in reverse from U.S. Steel to return to the rail loading facility.

Since this area is already developed for railroad use, impacts are expected to be minimal.

Evaluation of Alternative 11 - Alternative 11 is a lakefront transshipment alternative that involves the construction of the lakefront transshipment facility and an upriver railroad system. This alternative has the highest net annual benefits ($11,100,000) and the best benefit-to-cost ratio (3.91) of any of the alternatives investigated in the Preliminary study.

Construction of a transshipment facility and any means of upriver transshipment would be the responsibility of local interests. Therefore, this report does not attempt to determine what upriver transshipment mode should be utilized. The analysis performed does show lakefront transshipment to be the most economically efficient concept (maximum net benefits and greatest benefit/cost ratios), and the four transshipment schemes investigated (Alternatives 9-12) all appear to be environmentally, socially, financially, and institutionally feasible. This alternative was discussed with local officials and industry representatives at a workshop held at the start of this Final Feasibility investigation.

This alternative would require utilization of existing trackage owned by the Chessie Railroad Company. It would also require U.S. Steel to modify its present method of receipt of iron ore. This method would be reasonably energy efficient.

Although Alternative 11 proved to be the most economically efficient, of all preliminary plans considered, local interests and workshop participants did not select Alternative 11 as one of the possible alternatives to be investigated in greater detail. Since local interest preferred toeliminate Alternative 11, and since the Federal investment for Alternative 11 would be the same as for Alternative 9 and 10 with local interests incurring the additional costs as part of their non-Federal share, the District agreed to eliminate Alternative 11 from further consideration.

ALTERNATIVE 12 (LAKEFRONT TRANSSHIPMENT - TRUCK UPRIVER)

Description of Alternative 12 - This alternative would be similar to Alternative 10 except instead of a special purpose vessel there would be construction of an upriver truck system to carry material as far as the

U.S. Steel property. Construction items for this alternative are shown on Plate 17.

From the transshipment facility, a conveyor system would direct the material flow to the truck-loading facility along the Black River (Construction Item P). The truck-loading facility would be a surge-bin type hopper capable of quick-loading 55-ton trucks. A roadway which parallels the river would be constructed from the truck-loading facility upriver to U.S. Steel. A truck turnaround would be provided at each end. The exclusive roadway would require two 15-foot lanes, 14-foot shoulders, a reinforced concrete median barrier, and an overall right-of-way width on the order of 70 feet. Fencing would also be required along the length of the private roadway. A fleet of 16 trucks operating 24 hours per day, 7 days a week for the duration of the shipping season would be required to transport the maximum volume of materials forecasted by U.S. Steel. Cycle time for loading, overland haul, unloading, and returning is estimated at 32 minutes.

Cost Estimate for Alternative 12 - The total estimated first cost for Alternative 12, including land acquisition, is $43.0 million; the total investment cost, including interest during construction, is $45.9 million; and the total average annual charges are $4.9 million.

Economic Evaluation of Alternative 12 - The only benefit category applicable in this alternative is iron ore transportation savings. The total average annual benefits for Alternative 12 is $11,600,000. The net benefit is $6,700,000 and the benefit/cost ratio is 2.36. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio is shown in Table 28 below.

Table 28 - Summary of Benefits and Costs for Alternative 12 (1)

	Average Annual Charges ($ million per year)	Average Annual Benefits ($ million per year)	Net Average Annual Benefits ($ million per year)	Benefit/Cost Ratio
Total Project	4.9	11.6	6.7	2.36

(1) May 1980 price levels and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 12 - The transshipment facility at the lakefront and all other associated construction items - i.e. enlarging or reorienting the Outer Harbor - would be identical to Alternatives 9, 10, and 11. The outstanding feature of Alternative 12 would be the construction of an upriver truck system to carry material as far as the U.S. Steel property.

Temporary noise, dust, and odors would be experienced during construction of the roadway for the truck transport system. Some noise and dust would also be experienced during operation. Some existing railroad trackage would be converted to road, since the roadway would pass through existing railroad

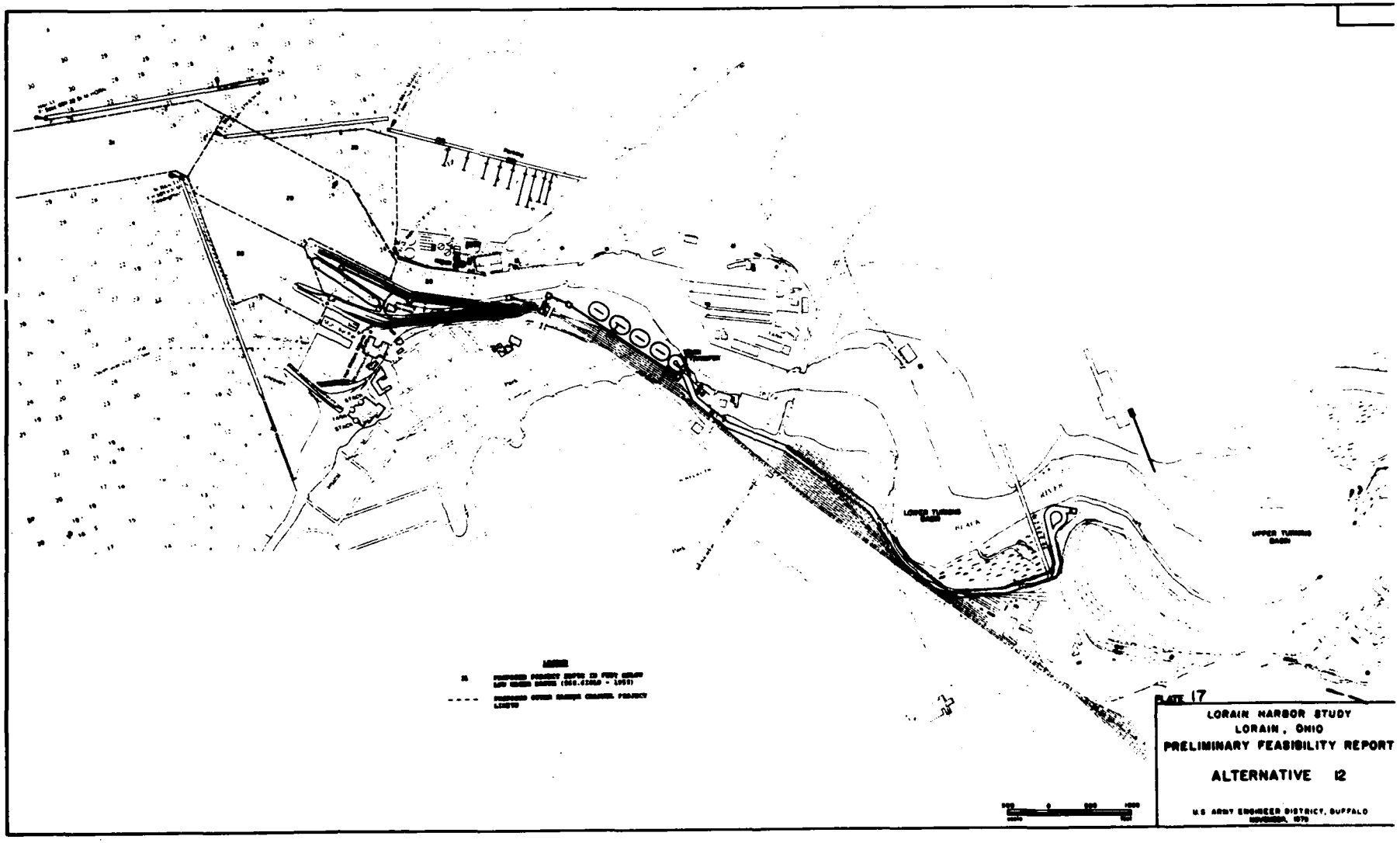


PLATE 17

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT

ALTERNATIVE 12

U.S. ARMY ENGINEER DISTRICT, BUFFALO

yards. Since the roadway would be in an industrial area, aesthetic impacts would be negligible.

Evaluation of Alternative 12 - Alternative 12 is a lakefront transshipment alternative that involves the construction of the lakefront transshipment facility and upriver movement of the bulk cargo by truck. This alternative is economically justified, but has the lowest net benefits of the four lakefront transshipment alternatives investigated in the Preliminary Study.

Construction of a transshipment facility and any means of upriver transshipment would be the responsibility of local interests. Therefore, this report does not attempt to determine what upriver transshipment mode should be utilized. The analysis performed does show lakefront transshipment to be the economically efficient concept (maximum net benefits and greatest benefit/cost ratios), and the four transshipment schemes investigated (Alternatives 9-12) all appear to be environmentally, socially, financially, and institutionally feasible. This alternative was discussed with local officials and industry representatives at a workshop held at the start of this Final Feasibility investigation.

This alternative would require acquisition of lands for the entire length of the river. It would also require U.S. Steel to modify their existing method of receipt of iron ore. This method of upriver transshipment is the least energy efficient of the four methods.

Although Alternative 12 exhibits economic feasibility, workshop participants did not desire further detailed consideration of Alternative 12. Since local interests prefered to eliminate Alternative 12 and since the Federal share for Alternative 12 is the same as for Alternatives 9 and 10, with local interests incurring the costs associated with the transshipment option as part of their non-Federal share, the District agreed to eliminate Alternative 12 from further consideration.

ALTERNATIVE 13 - (LAKEFRONT TRANSSHIPMENT WITH CONVEYOR UPRIVER; PLUS RIVERSIDE PARK CUT FOR AMSHIP).

Description of Alternative 13 - This alternative is identical to Alternative 9 except for an added construction item. This additional item is the construction of a new channel through Riverside Park (Construction Item B), as described in Alternative 1. The construction of the Riverside Park Cut would enable easy access to the American Shipbuilding facility by the larger Class 10 vessels. The components of this alternative are shown on Plate 18.

Cost Estimate for Alternative 13 - The total estimated first cost for Alternative 13, including land acquisition, is $79.6 million; the total investment cost, including interest during construction, is $85.3 million; and the total average annual charges are $7.4 million. The cost of providing the incremental feature of the Riverside Park cut are $20.8 million with average annual changes amounting to $1.7 million.

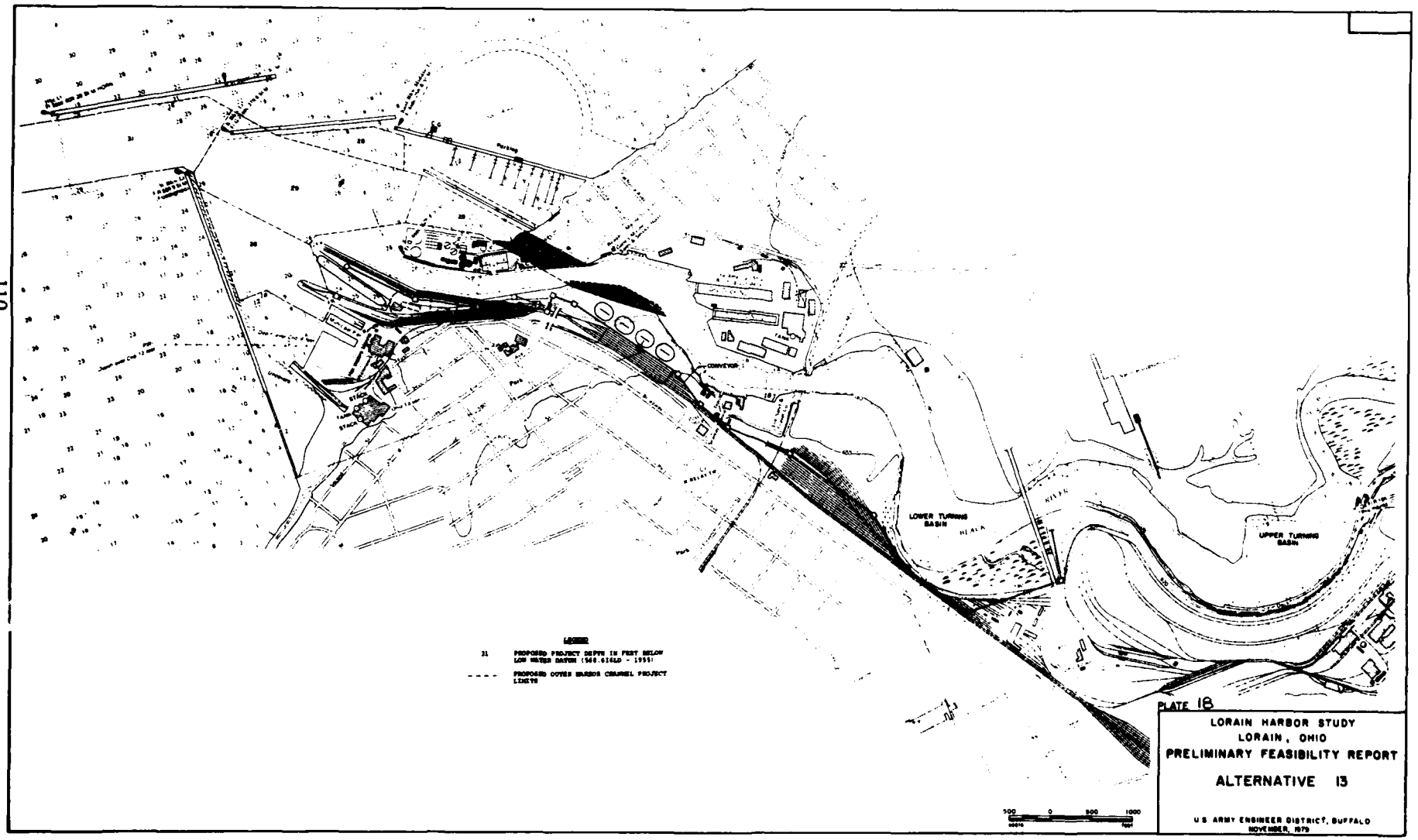


PLATE 18

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT

ALTERNATIVE 13

U.S. ARMY ENGINEER DISTRICT, BUFFALO
NOVEMBER, 1979

Economic Evaluation of Alternative 13 - Benefit categories included in this alternative are: (1) iron ore transportation savings, and (2) future vessels launching costs avoided. The total average annual benefit for Alternative 13 is $16,000,000. The net benefit is $8,600,000 and the benefit/cost ratio is 2.16. The additional benefits to be realized by making the Riverside Park cut are $200,000 but they do not outweight the additional costs incurred by constructing the cut ($1,700,000). A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio for the total project and the Riverside Park Cut increment are shown in Table 29 below.

Table 29 - Summary of Benefits and Costs for Alternative 13 (1)

	Average Annual Charges ($ million per year)	Average Annual Benefits ($ million per year)	Net Average Annual Benefits ($ million per year)	Benefit/Cost Ratio
Total Project	7.4	16.0	8.6	2.16
Incremental Values for Riverside Park Cut	1.7	0.2	-1.5	0.12

(1) May 1980 price levels and 7-3/8 percent interest rate.

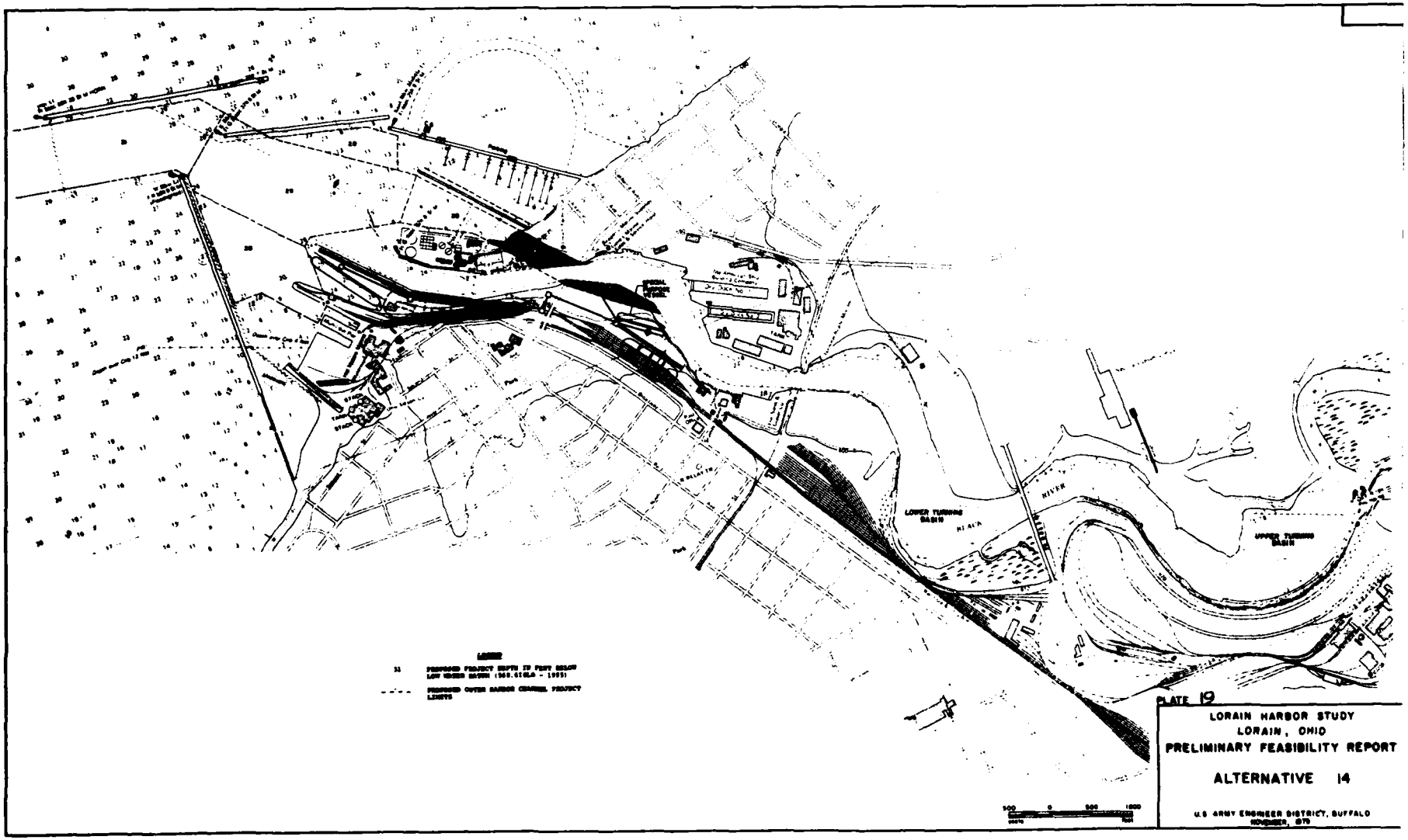
Environmental Features/Assessment of Plan 13 - This alternative would be identical to Alternative 9 which calls for enlarging or reorienting the Outer Harbor entrance, constructing a transshipment facility at lakefront, and constructing an upriver conveyor system. It would also include the additional item of a new channel that would be constructed through Riverside Park, as discussed under Alternative 1.

The Riverside Park Cut would enable easy access to American Shipbuilding facility by larger vessels as well as allow conveyor transshipment upriver to the U.S. Steel plant.

Evaluation of Alternative 13 - Alternative 13 is essentially the same as Alternative 9 with the addition of a Riverside Park Cut. The additional costs incurred for making the Riverside Park Cut exclusively for Amship are not incrementally justified (incremental costs = $1,700,000; incremental benefits = $200,000; incremental B/C ratio = 0.12). Therefore, it was concluded that Alternative 13 should not be considered further.

ALTERNATIVE 14 - (LAKEFRONT TRANSSHIPMENT WITH SPECIAL PURPOSE VESSEL UPRIVER; PLUS RIVERSIDE PARK CUT FOR AMSHIP)

Description of Alternative 14 - This alternative would be identical to Alternative 10 with the addition of the cut through Riverside Park (Construction Item B) to service the American Shipbuilding facility (see Plate 19).


LOWER TURNING BASIN
RIVER
UPPER TURNING BASIN
PLATE 19
LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT
ALTERNATIVE 14
U.S. ARMY ENGINEER DISTRICT, BUFFALO

Cost Estimate for Alternative 14 - The total estimated first cost for Alternative 14, including land acquisition, is $70.3 million; the total investment cost, including interest during construction, is $75.3 million; and the total average annual charges are $6.6 million. The costs associated with the Riverside Park Cut feature amount to $20.3 million with average annual changes of $1.7 million.

Economic Evaluation of Alternative 14 - Benefit categories included in this alternative are: (1) iron ore transportation savings, and (2) future vessels launching costs avoided. The total average annual benefit for Alternative 14 is $12,500,000. The net benefit is $5,900,000 and the benefit/cost ratio is 1.89. The incremental costs associated with construction of the Riverside Park Cut are $1.7 million with a corresponding increase in benefits of $200,000. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio for both the total project and the incremental Riverside Park Cut feature, are shown in Table 30 below.

Table 30 - Summary of Benefits and Costs for Alternative 14 (1)

	Average Annual Charges ($ million per year)	Average Annual Benefits ($ million per year)	Net Average Annual Benefits ($ million per year)	Benefit/Cost Ratio
Total Project	6.6	12.5	5.9	1.89
Incremental values for Riverside Park Cut	1.7	0.2	-1.5	0.12

(1) May 1980 price levels and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 14 - This alternative would have features identical to Alternative 10, which includes enlarging or reorienting the Outer Harbor entrance, constructing a transshipment facility at lakefront, and constructing an upriver special purpose vessel facility, with the addition of the channel cut through Riverside Park (Construction Item B), as discussed under Alternative 13.

Evaluation of Alternative 14 - Alternative 14 is essentially the same as Alternative 10 with the addition of a Riverside Park Cut. The additional annual benefits to be realized by making the Riverside Park Cut exclusively for AmShip, are not incrementally justified (incremental costs = $1.7 million; incremental benefits = $200,000; incremental B/C ratio = 0.12). Therefore, this alternative was not considered further.

ALTERNATIVE 15 (LAKEFRONT TRANSSHIPMENT WITH RAIL UPRIVER; PLUS RIVERSIDE PARK CUT FOR AMSHIP).

Description of Alternative 15 - This alternative is identical to Alternative 11 but has the addition of the Riverside Park Cut (Construction Item B) to provide access by large vessels to the American Shipbuilding facility (see Plate 20).

Cost Estimate for Alternative 15 - The total estimated first cost for Alternative 15, including land acquisition, is $57.2 million; the total investment cost, including interest during construction, is $61.2 million; and the total average annual charges are $5.5 million. The costs associated with the Park Cut feature are $20.2 million with increase annnual changes amounting to $1.7 million.

Economic Evaluation of Alternative 15 - Benefit categories included in this alternative are: (1) iron ore transportation savings, and (2) future vessels launching costs avoided. The total average annual benefit for Alternative 15 is $15,000,000. The total project net benefit is $9,500,000 and the total project benefit/cost ratio is 2.73. Corresponding benefits for the incremental Riverside Park Cut construction item are $200,000. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio for the total project and the Riverside Park Cut increment are shown in Table 31 below.

Table 31 - Summary of Benefits and Costs for Alternative 14 (1)

	Average Annual Charges ($ million per year)	Average Annual Benefits ($ million per year)	Net Average Annual Benefits ($ million per year)	Benefit/Cost Ratio
Total Project	5.5	15.0	9.5	2.73
Incremental Values for Riverside Park Cut	1.7	0.2	-1.5	0.12

(1) May 1980 price levels and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 15 - This alternative would have features identical to Alternative 11; enlarge or reorient Outer Harbor entrance, construct transshipment facility at lakefront, and construct upriver rail facility, with the addition of the channel cut through Riverside Park, as discussed under Alternative 13.

Evaluation of Alternative 15 - Alternative 15 is essentially the same as Alternative 11 with the addition of a Riverside Park Cut. The additional annual costs incurred for making the Riverside Park Cut exclusive for AmShip are not incrementally justified. Therefore, it was concluded that

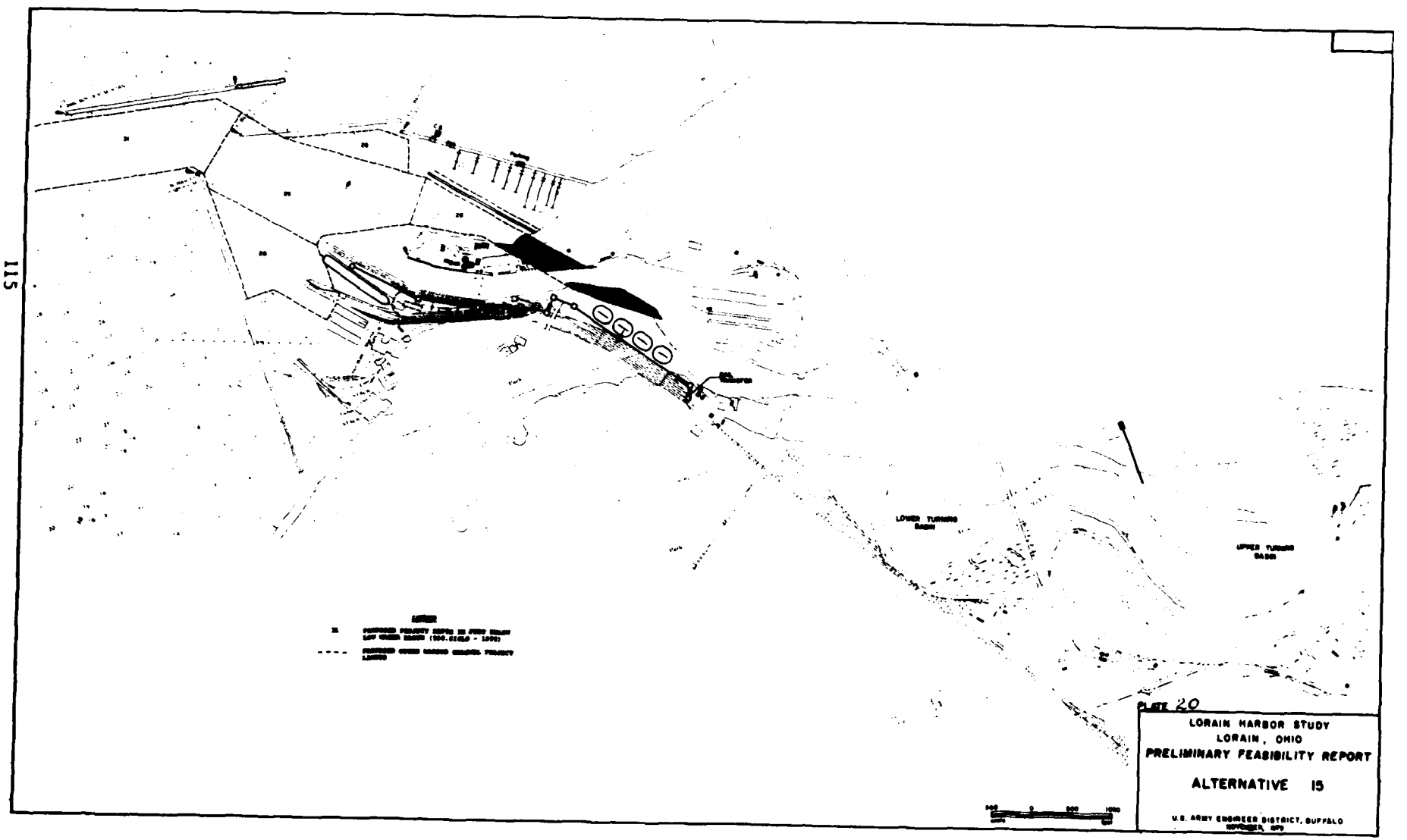


PLATE 20

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT

ALTERNATIVE 15

U.S. ARMY ENGINEER DISTRICT, BUFFALO

Alternative 15 should not be considered further based on the benefit categories identified in the preliminary studies.

ALTERNATIVE 16 (LAKEFRONT TRANSSHIPMENT WITH TRUCK UPRIVER; PLUS RIVERSIDE PARK CUT FOR AMSHIP).

Description of Alternative 16 - This alternative would have the features identical to Alternative 12 with the addition of the cut through Riverside Park to provide better access by 1,000-foot vessels to the American Shipbuilding facility (see Plate 21).

Cost Estimate for Alternative 16 - The total estimated first cost for Alternative 16, including land acquisition, is $61.8 million; the total investment cost, including interest during construction, is $66.1 million; and the total average annual charges are $6.6 million. The costs associated with the Riverside Park Cut feature amount to $20.7 million with corresponding average annual changes of $1.7 million.

Economic Evaluation of Alternative 16 - Benefit categories included in this alternative are: (1) iron ore transportation savings, and (2) future vessels launching costs avoided. The total average annual benefit for Alternative 16 is $11,700,000. The net benefit is $5,100,000 and the benefit/cost ratio is 1.77. The corresponding incremental benefits associated with the Riverside Park Cut feature amount to $200,000. A summary of annual charges, annual benefits, net benefits, and benefit-to-cost ratio for both the total project and the incremental Riverside Park Cut feature are shown in Table 32.

Table 32 - Summary of Benefits and Costs for Alternative 16 (1)

	Average Annual Charges ($ million per year)	Average Annual Benefits ($ million per year)	Net Average Annual Benefits ($ million per year)	Benefit/Cost Ratio
Total Project	6.6	11.7	5.1	1.77
Incremental Values for Riverside Park Cut	1.7	0.2	-1.5	0.12

(1) May 1980 price levels and 7-3/8 percent interest rate.

Environmental Features/Assessment of Plan 16 - This alternative would have features identical to Alternative 12; enlarge or reorient Outer Harbor entrance, construct transshipment facility at lakefront, and construct upriver truck system, with the addition of the channel cut through Riverside Park, as discussed under Alternative 13.

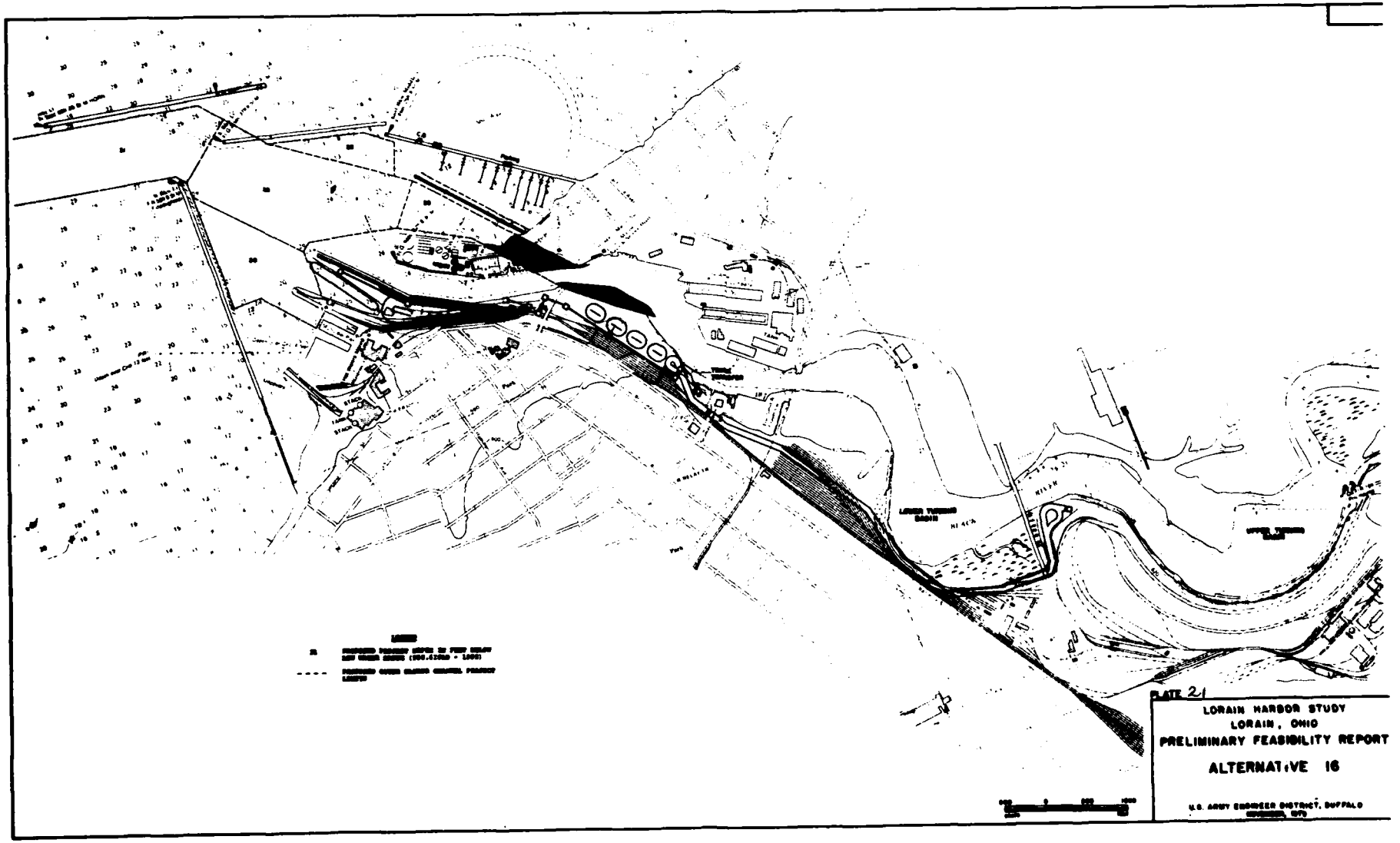


PLATE 21

LORAIN HARBOR STUDY
LORAIN, OHIO
PRELIMINARY FEASIBILITY REPORT

ALTERNATIVE 16

U.S. ARMY ENGINEER DISTRICT, BUFFALO

Evaluation of Alternative 16 - Alternative 16 is essentially the same as Alternative 12 with the addition of a Riverside Park Cut. The additional annual cost incurred for making the Riverside Park Cut for AmShip are not incrementally justified. Therefore, Alternative 16 was not considered further.

ALTERNATIVE 17 (NO-ACTION (DO NOTHING))

Description of Alternative 17 - The No-Action (Do Nothing) Alternative for Lorain Harbor represents the base condition for evaluation of the alternatives discussed above. It provides for the existing program of harbor maintenance, but does not provide for further harbor modifications required for more efficient operation of bulk cargo vessels utilizing Lorain Harbor. Because of inadequate, channel depth, these vessels would be forced to navigate at less than the Great Lakes systems draft of 25.5 feet. As vessel traffic increases in response to projected increases in tonnages existing problems related to safe and efficient navigation would intensify.

Water quality in the Black River is expected to improve in the future due to cleaner industrial and nonindustrial discharges into the river. However, vessel traffic will continue to contribute fuel oil and other contaminants. Sediments are expected to remain polluted since they will only be removed by periodic dredging operations. Fish and wildlife habitat is not expected to increase due to the industrial nature of the area and its use as a commercial port.

This alternative is not favored by local interests, because it does not meet the planning objective of improving conditions for commercial navigation by vessels currently using the harbor including Class X vessels. Problems and needs stated earlier in this report would remain unchanged.

Alternative 17 is presented in this Final Feasibility Study as the basis of comparison to other alternatives.

CONCLUSIONS BASED ON FORMULATION AND EVALUATION OF PRELIMINARY PLANS

Initially there were nine concepts considered as possible solutions for meeting the planning objective of improvements to Lorain Harbor for commerical navigation. Of these, six were eliminated during the initial iteration due to overriding functional, economic, environmental or operational problems. The three remaining concepts were then further developed into 16 alternatives and studied in depth in the Preliminary Study. The 17th alternative, the No Action (Do Nothing) Plan, was included as the "basis of comparison" to the 16 structural plans and as a candidate for the "selected plan" in the event none of the action (or structural) plans are implementable.

TRADEOFF ANALYSIS

All of the alternatives developed, except the No-Action plan, contain modifications to the harbor area to allow Class X vessels to more safely and efficiently enter Lorain Harbor and also allow the vessels to be loaded to a

system-wide draft of 25.5 feet. Alternatives 1 through 4 deal with improvements to allow Class X vessels to navigate the entire length of the Federal project. Alternatives 5 through 8 would limit the reach of river the Class X vessels could transit to that portion north of the 21st Street Bridge with transshipment from the bridge to the U.S. Steel Plant, a short distance further upstream (south). Alternatives 9-16 call for improvements to the harbor area only with iron ore for U.S. Steel being transshipped from the lakefront by either conveyor, special purpose vessel, rail or truck. Alternative 17, No-Action, is used as the basis of comparison. Existing iron ore flows to the lakefront dock would also benefit.

In developing these preliminary alternatives, primary consideration was given to economic considerations, potential adverse environmental impacts, and effects on existing and proposed facilities. From investigations performed as part of this study, there appear to be no serious environmental impacts associated with any of the alternatives. The alternatives were developed such that the impact on existing facilities would be minimal. Therefore, the overriding consideration used to determine which alternatives would be carried into the Final Feasibility portion of this study is economic efficiency of future investments to the Federal project.

RATIONALE FOR PLANS ELIMINATED (ALTERNATIVES 1-8 AND 11-16) FROM FURTHER DETAILED STUDY

As stated in the Trade Off Analysis section above, the overriding consideration in choosing which alternatives deserve further study and which will be eliminated is the relative economic efficiency and associated project costs of each alternative.

Direct Delivery (Alternatives 1-4) - The Direct Delivery Alternatives range in cost from $189,000,000 to $282,000,000. Annual Charges range from $15,300,000 to $23,100,000. Alternatives 2 and 4 are not economically justified (B/C less than 1). Plans 1 and 3 are only marginally justified (B/C of 1.14 and 1.01 respectively.) These alternatives also require the largest outlay of both Federal and non-Federal funds and require the most land acquisition and cause the most disruption to existing conditions. For these reasons Alternatives 1-4 are eliminated from further consideration.

Transshipment from North of 21st Street Bridge (Alternatives 5-8) - The cost for Alternatives 5 through 8 range from $106,100,000 to $196,500,000. Annual charges range from $8,800,000 to $16,400,000. Alternatives 5, 6, and 7 are economically justified with Alternative 5 being the most economically efficient having a benefit-cost ratio of 1.89. Alternative 8 is not economically justified (benefit/cost ratio less than 1). Alternatives 5, 6, and 7 although economically justified, are significantly more expensive, require significantly more land acquisition and cause much greater disruption to existing conditions than do Alternatives 9-16. Therefore, Alternatives 5-8 were also eliminated from further consideration.

Lakefront Transshipment, No Riverside Park Cut (Alternatives 11 and 12) - These alternatives all involve construction of a lakefront transshipment facility and transshipment of the iron ore upriver to U.S. Steel by either

conveyor (Alt 9), special purpose vessel (Alt 10), train (Alt 11), or truck (Alt 12). Alternatives 11 and 9 have the maximum net benefits of $11,100,000 and $10,100,000 and benefit-to-cost ratios of 3.91 and 2.78 respectively. However, since any transshipment mode would be entirely the responsibility of local interests, it was concluded that the preferred transshipment alternative(s) investigated in Final Feasibility should be decided by local interests. Workshops were held at the beginning of the Final Feasibility investigation for the purpose of obtaining local views on the preferred transshipment alternatives. As discussed in the text below, it was ultimately decided to eliminate Alternative 11 (train) and Alternative 12 (truck) from further consideration, and to carry forward Alternative 9 (conveyor) and Alternative 10 (special purpose vessel).

Lakefront Transshipment With Riverside Park Cut (Alternatives 13-16) - Alternatives 13-16 are similar to Alternatives 9-12 except that a Riverside Park Cut would be added for the specific purpose of providing operational savings to AmShip by eliminating the need for tug assistance to Class 10 vessels. The additional benefits attributable to the Riverside Park Cut are less than the additional costs incurred. Since Alternatives 9-12 fulfill the planning objectives and have greater net benefits, Alternatives 13-16 warrant elimination from further consideration.

LOCAL RESPONSE TO EVALUATION OF PRELIMINARY FEASIBILITY ALTERNATIVES

A commercial navigation workshop meeting was held at the Lorain City Hall on 4 February 1981 to discuss the findings of the Preliminary Feasibility Study with local interests. Minutes are included in Appendix E.

The three concepts discussed at this workshop were as follows:

Concept 1 - Direct Delivery (Alternatives 1-4) - Improvements to allow 1,000-foot vessels to transit 3 miles of the Black River to the U. S. Steel facility at the head of commercial navigation.

Concept 2 - Partial Transshipment (Alternatives 5-8) - Improvements to allow 1,000-foot vessels to transit the Black River to a point just north of the 21st Street Bridge and construction of a transshipment facility at that point to transship the iron ore on upriver to the U. S. Steel plant at the head of commercial navigation.

Concept 3 - Lakefront Transshipment (Alternatives 9-16)

a. Lakefront Transshipment Without Riverside Park Cut (Alternatives 9-12) - Improvements to allow 1,000-foot vessels to enter the harbor and construction of a transshipment facility at the lakefront to transship the iron ore upriver to the U. S. Steel plant at the head of commercial navigation.

b. Lakefront Transshipment With Riverside Park Cut (Alternatives 13-16) - The same as Concept 3a with the addition of a cut through Riverside Park to enable 1,000-foot vessels to transit the river to the American Shipbuilding facility.

Construction items, costs, and benefits were discussed for each of the 16 alternatives. Buffalo District staff stated that Lakefront Transshipment Without Riverside Park Cut (Alternatives 9-12) was the concept that the Corps felt warranted further study because this concept had the highest benefit-cost ratios and highest net benefits. The workshop participants were told that the four alternative modes of upriver transshipment investigated by the District were conveyor, rail, truck, and special purpose vessel.

Workshop participants voiced strong concern in regard to elimination of the Riverside Park Cut. They felt that for any future development in the Lorain Harbor area, the Riverside Park Cut was necessary. Mr. David Van Brunt of U. S. Steel suggested that an alternative of bringing 1,000-foot vessels upriver to the storage area on the west bank across from Amship be considered. He noted that this alternative would eliminate the need for the lakefront off-load hopper, the conveyor used to transfer the ore from the hopper to the storage piles, and the stacker at the storage piles. The elimination of these three construction items might offset the additional cost for the Riverside Park Cut, thus providing incremental justification of the Riverside Park Cut.

A representative of Interlake Steamship Company concurred with Mr. Van Brunt's statement. He also stated that Interlake Steamship Company considers that the Lorain Outer Harbor is too congested, and is susceptible to large amounts of surging at the proposed location of the transshipment facility on the lakefront. The surge problem would make off-loading into the lakefront hopper impracticable, except in calm weather. Therefore, any alternatives utilizing the Outer Harbor for docking and off-loading is not feasible. Only alternatives in the river are feasible from an operational view.

Another question raised by workshop participants concerned additional benefit categories. These included vessel delay benefits due to the congestion problem at the Republic Steel transshipment facility at the mouth of the Black River, and vehicle delays due to additional openings of the Erie Avenue Bridge. The participants were informed that benefits had not yet been calculated for either of these categories because the potential congestion problem surfaced too late for inclusion in the Preliminary Feasibility Report (October 1980) and the vehicle delays would not be large enough to change the benefits for any of the alternatives.

Because of the items discussed above, the workshop participants requested that the Buffalo District evaluate an alternative of directly off-loading 1,000-foot vessels at a transshipment site on the west bank of the Black River just south of the Erie Avenue Bridge taking into consideration the following items:

a. Reduced cost (as compared to the Corps recommended plans) due to elimination of the lakefront off-load hopper, conveyor from the lakefront to the storage piles and the ore stacker.

b. Increased benefits due to savings from reduced vessel delays through elimination of the congestion problem at the Republic Steel transshipment facility.

The participants felt that these changes would make the inclusion of the Riverside Park Cut a viable option. Buffalo District agreed to evaluate the new alternatives to determine whether they warranted further study. In addition it was agreed to defer selection of the two lakefront transshipment alternatives (out of Alternatives 9-12) for further study until after the preliminary evaluation of the new alternatives were completed and presently at a later workshop.

ECONOMIC EFFICIENCY OF NEW ALTERNATIVES

A very preliminary evaluation of both the costs and benefits for these new alternatives was made by the District to determine whether, more detailed study would be warranted in the Final Feasibility Study. No attempt was made initially to investigate the new alternatives to the same level as the 16 presented previously in this report. The results of the cursory economic analysis are discussed below. The basis of comparison is Alternatives 9 through 12 which would provide improvements similar to the new alternatives.

Corps policy requires that each additional project feature of an alternative be incrementally justified; i.e., have sufficient additional benefits to offset additional costs. Alternatives 9-12 appear to be workable alternatives with favorable benefit-cost ratios and substantial net benefits. The additional cost of the separable project features associated with the Riverside Park Cut, when compared to Alternatives 9-12 was estimated at about $8.9 million. Annual charges for this additional cost, are $0.6 million. The preliminary commercial navigation benefits attributable to the items generating these additional costs were estimated to be $0.7 million. Therefore, the preliminary benefit-cost ratio for the additional portion of the new alternative is $0.7 million/$0.6 million = 1.16, indicating incremental justification for the additional construction features of the new alternatives.

SUMMARY OF ALTERNATIVES EVALUATION

The preliminary screening showed that the alternatives suggested at the 4 February 1981 workshop compare favorably with the alternatives previously chosen for further study in the Preliminary Feasibility Study. It has also shown that the additional construction items required for the new alternatives are incrementally justified.

Further investigation of the congestion problem was determined to be warranted. A more accurate determination of the magnitude of delay and number and size of vessels delayed is presented in the discussion on the detailed plans.

Therefore, the District concluded that the new alternatives should be carried into detailed study along with two of the four transshipment alternatives (Alternatives 9-12).

PRESENTATION OF FINDINGS ON NEW ALTERNATIVES

A second commercial navigation workshop was held on 7 April 1981 to present the findings of the evaluation of the new alternatives put forth by local interests at the 4 February 1981 workshop. The local interests were told that the preliminary screening of the new alternatives showed that additional study was warranted. Therefore, the new alternatives would be carried forward into detailed analysis. With regards to the preferred modes of upriver transshipment (i.e., conveyor, special purpose vessel, rail and truck), the Lorain Port Authority requested additional time to survey harbor users prior to selecting two of the four modes for further study. The District agreed, and the Port Authority, as the potential local cooperator for the project subsequently surveyed all harbor users as to their preference.

DECISION ON MODES OF TRANSSHIPMENT FOR FINAL FEASIBILITY STUDIES

Utilizing input from port users and their own expertise, the Lorain Port Authority informed Buffalo District that they concurred with the District's view that the modes of upriver transshipment that should be carried into Final Feasibility are conveyor (Alternative 9) and special purpose vessel (Alternative 10).

All port users responding also agreed that the Riverside Park Cut was an important part of any harbor improvement and should be included in any alternative considered.

SUMMARY

Of the 17 alternatives developed during preliminary planning, only those alternatives utilizing Lakefront transshipment without Riverside Park Cut (Alternatives 9-12) were recommended for further investigation because they had the highest net benefits and benefit-cost ratios.

Based on input received from the Lorain Port Authority and other commercial and local interests, the recommendation was made that the modes of upriver transshipment which would be carried into detailed planning would be by conveyor (Alternative 9) and special purpose vessel (Alternative 10).

Also, based on input received from local interests from two workshop meetings held at the end of preliminary planning, commercial interests identified a congestion problem at the mouth of the Black River and the need for the Riverside Park Cut. In conjunction with the Park Cut, it was also suggested that the possibility of constructing a transshipment facility just upstream of the Erie Avenue Bridge be investigated. These suggestions resulted in the development of two additional alternatives not previously identified. These plans are Alternative 9A (Riverside Park Cut with a Transshipment Facility Just Upstream of the Erie Avenue Bridge, and Upriver Transshipment by Conveyor), and Alternative 10A which is the same as Alternative 9A except upriver transshipment is by special purpose vessel.

ASSESSMENT AND EVALUATION OF DETAILED PLANS

The previous section, Assessment and Evaluation of Preliminary Plans, concluded that of the 17 plans considered in the Preliminary Feasibility Report, four be carried forward into Final Feasibility for further consideration (Alternatives 9, 9A, 10 and 10A). Therefore, the Buffalo District concentrated its effort on further developing and refining these proposed alternatives during the detailed stage of study. This section provides information on the Final Feasibility Report (FFR) investigations and results involving the engineering designs, economic evaluations, and environmental assessments for the plans developed to solve the commercial navigation problems at Lorain, OH. Appendices A through H of the report are under separate cover and provide additional details on the engineering and economics analysis. These appendices are:

Appendix	Title
A	Geotechnical Design
B	Economic Evaluation
C	Design and Cost Estimates
D	Correspondence
E	Public Involvement
F	Fish and Wildlife
G	Dredged Material Disposal Investigation of Alternative Disposal Sites
H	Cultural Resources

LOCAL INPUT SUBSEQUENT TO PRELIMINARY FEASIBILITY REPORT

Subsequent to the issuance of the PFR in October 1980 (Revised May 1981) the Buffalo District requested additional information from U. S. Steel regarding existing and future raw material requirements and the future fleet mix to their Lorain plant. U. S. Steel responded to these inquires in a letter dated 17 August 1981 (see Appendix D). The major thrust of their response regarded the future fleet mix scheduled to deliver iron ore to their Lorain plant. U. S. Steel now anticipates that vessels up to 767 feet by 72 feet (Class 8) will be the largest ships participating in the Lorain upriver trade in the foreseeable future. (The Preliminary Feasibility Report had considered U. S. Steel utilizing vessels up to 1,000 feet in length). In their letter they also requested that the Riverside Park Cut still be considered to eliminate congestion at the mouth of the Black River.

Associated with the use of these 767 X 72-foot vessels, U. S. Steel also identified a requirement to "light-load" these vessels due to bend constrictions in the Black River. They stated that the light loading is due to constrictions in the existing channel at three locations where, in order for this size of vessel to negotiate these turns, it is necessary to restrict drafts by 1 foot. They have requested that the Buffalo District investigate the possibility of widening the following three bends: (1) the east turn

immediately upstream of the Norfolk and Western Railroad Bridge, (2) the west bend just downstream of the 21st Street bridge; and (3) the east bend immediately upstream of the 21st Street Bridge.

FINAL FEASIBILITY FORMULATION AND EVALUATION

Based on information received from U. S. Steel regarding their most probable maximum size of vessel which would be utilizing the Black River and the problem of "light-loading" these vessels due to bend constrictions, the Buffalo District considered that further investigation was warranted.

The existing Black River Channel was designed to permit navigation by Class 7 vessels, which vary from 700 feet to 730 feet in length. The District evaluated the need for the bend cuts suggested by U. S. Steel for their Class 8 vessels. The Apex or Cutoff Method described in Chapter 10 of Report No. 3 entitled "Evaluation of Present State of Knowledge of Factors Affecting Tidal Hydraulics and Related Phenomena" dated May 1965 was utilized to approximate the required widening in the bend. A two dimensional scale model of a 767-foot vessel was then used to optimize the required bank cut as the vessel navigates the bends. This analysis confirmed the position of U. S. Steel Corp. that existing channel widths restricted operating drafts of Class 8 vessels.

To address these new problems and concerns the District developed two additional alternatives which consider the justification for providing these upriver bend cuts to facilitate navigation of the Black River by Class 8 vessels and to allow for maximum system loading of these vessels. These alternatives would provide for direct delivery to the U. S. Steel plant in the 767-foot vessels (thereby eliminating the need for a transshipment facility to service U. S. Steel) and also include the necessary Outer Harbor modifications to allow use of the Outer Harbor by Class X vessels inbound for Republic's transshipment facility. These two new alternatives are designated Alternatives 18 and 18A and are briefly described below:

Alternative 18 - Direct delivery of iron ore to upriver stockpiles, and upriver bend widening.

Alternative 18A - Direct delivery of iron ore to upriver stockpiles with the Riverside Park Cut and upriver bend widening.

Even though recent input from U. S. Steel indicates that the most probable future is that 767 X 72-foot vessels will be the largest vessels in upriver trade, the District considered that this should not eliminate from further consideration the alternatives which evolved from preliminary planning which considered the use of 1,000-foot vessels and transshipment facilities.

These Alternatives (9, 9A, 10 and 10A) should still be addressed in order to assess the impacts these plans would have should, sometime in the future, 1,000-foot vessels be involved in upriver trade. Therefore, the following

six alternatives are considered in detail for this report and are summarized below:

Alternative 9 - Delivery to the Lakefront in Class X vessels, including Outer Harbor modifications, lakefront transshipment facility and an upriver conveyor system.

Alternative 9A - Direct delivery in Class X vessels to a newly constructed transshipment facility located immediately upstream of Erie Avenue. This plan involves Outer Harbor modifications, Riverside Park Cut, upriver transshipment facility and an upriver conveyor system.

Alternative 10 - Similar to Alternative 9 except instead of an upriver conveyor system, a special purpose vessel would be used to transport the ore upriver.

Alternative 10A - Similar to Alternative 9A except that upriver shipment from the Erie Avenue transshipment facility is by special purpose vessel instead of a conveyor.

Alternative 18 - Direct delivery to upriver stockpiles by 767-foot vessels to the upstream end of the Federal project including Outer Harbor modifications and upriver bend widening.

Alternative 18A - Similar to Alternatives 18 except it also includes construction of the Riverside Park Cut.

In addition, the basis of comparison for the above listed alternatives is:

Alternative 17 - No Action, or Do Nothing Plan.

A discussion of the six alternatives considered for detailed design including benefit/cost information is contained in the following paragraphs. All costs are based on December 1981 price levels. Average annual costs and benefits are based on a 50-year project life and an interest rate of 7-5/8 percent.

Although the costs and benefits displayed here reflect FY 82 price levels and interest rates, the relative ranking of these plans by net benefits and/or benefit/cost ratio will not change when these plans are updated to FY 83 price levels and interest rates for the FFR.

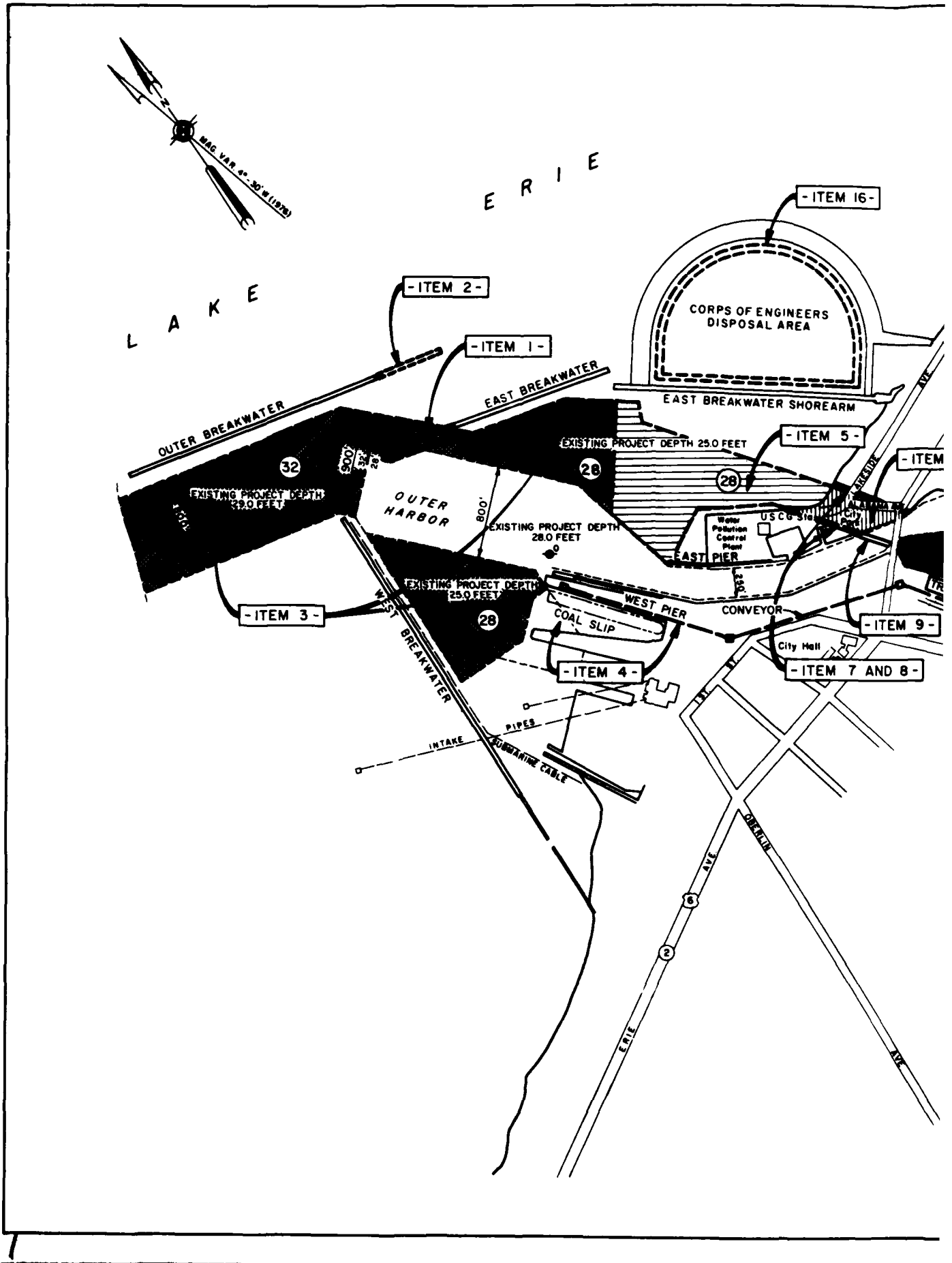
In developing these alternative plans of improvement a total of 16 principal construction features are required. Plate 22 shows the location of these construction items and a matrix showing the construction items common to each alternative is provided in Table 33. Appendix C contains a detailed description and cost estimate for each of the construction items.

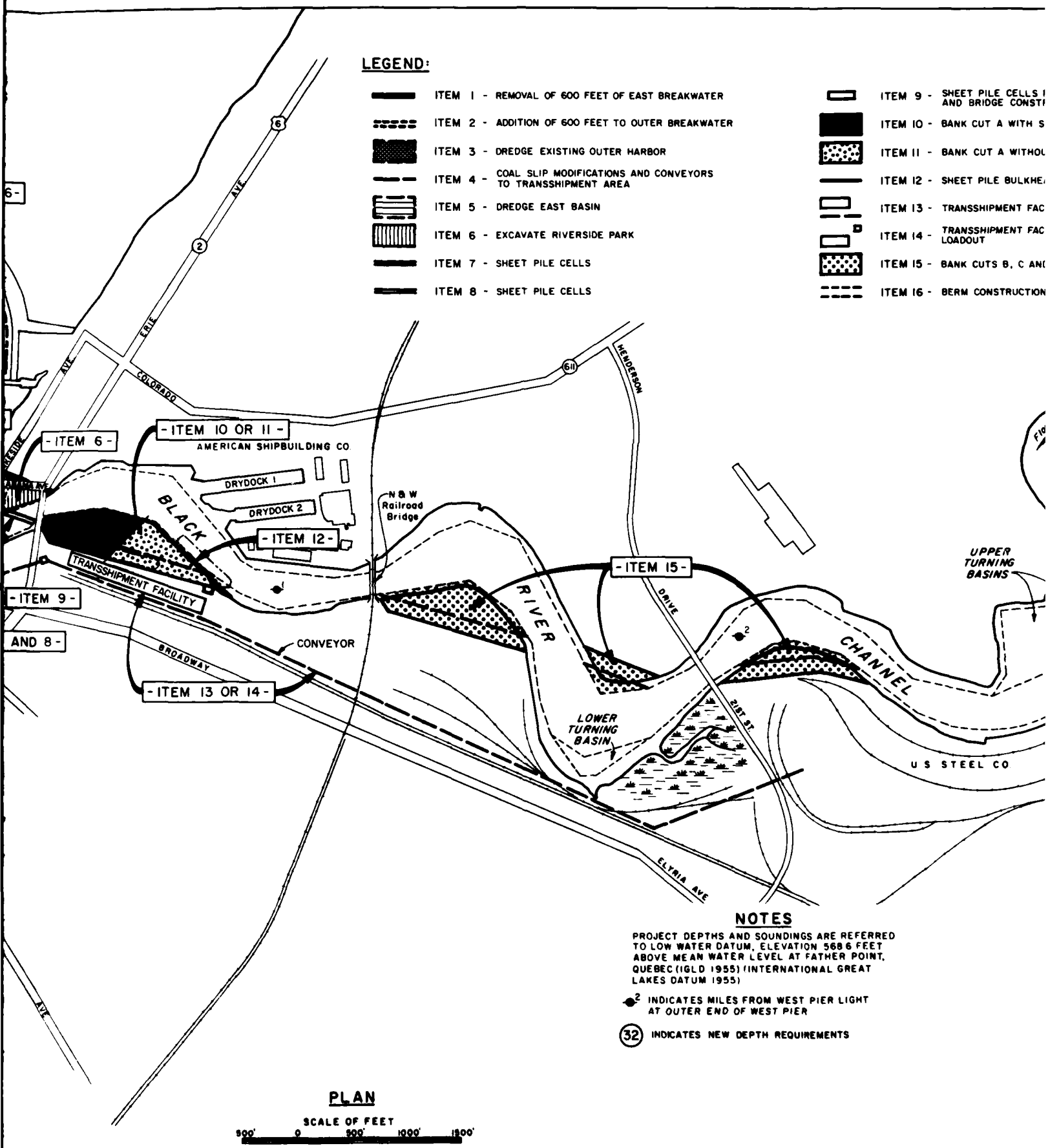
FINAL FEASIBILITY EVALUATION CRITERIA

The emphasis in the FFR was to present, in a more detailed analysis, those plans recommended from the PFR and those plans which were developed subsequent to the completion of the PFR. These alternatives were modified in varying degrees due to changes in technical criteria since the Preliminary Report. Criteria which changed since the PFR are presented below.

Table 33 - Lorain Harbor Navigation Improvements

Construction Item	Alternatives					
	9	9A	10	10A	18	18A
1. Remove 600 Feet of East Breakwater	X	X	X	X	X	X
2. Add 600 Feet to Outer Breakwater	X	X	X	X	X	X
3. Dredge Existing Outer Harbor	X	X	X	X	X	X
4. Coal Slip Modifications and Conveyor to Transshipment Facility	X		X			
5. Dredge East Basin		X		X		X
6. Excavate Riverside Park		X		X		X
7. Sheet Pile Cells		X		X		X
8. Sheet Pile Cells		X		X		X
9. River Diversion and Bridge		X		X		X
10. Bank Cut A with Sheet Pile Protection		X		X		
11. Bank Cut A without Sheet Pile Protection						X
12. Sheet Pile Bulkhead for Special Purpose Vessel			X			
13. Transshipment Facility with Upriver Conveyor	X	X				
14. Transshipment Facility with Special Purpose Vessel Loadout			X	X		
15. Bank Cuts B, C, D					X	X
16. Berm Construction-Diked Disposal Area	X	X	X	X	X	X


MAG VAR 6° 30' W (1978)
LAKE ERIE
- ITEM 16 -
CORPS OF ENGINEERS DISPOSAL AREA
EAST BREAKWATER SHOREARM
- ITEM 2 -
- ITEM 1 -
OUTER BREAKWATER
EAST BREAKWATER
EXISTING PROJECT DEPTH 25.0 FEET
- ITEM 5 -
32
28
OUTER HARBOR
EXISTING PROJECT DEPTH 29.0 FEET
EXISTING PROJECT DEPTH 28.0 FEET
Water Pollution Control Plant
USCG Sta
EAST PIER
EXISTING PROJECT DEPTH 25.0 FEET
WEST PIER
CONVEYOR
- ITEM 3 -
WEST BREAKWATER
COAL SLIP
- ITEM 9 -
City Hall
- ITEM 4 -
- ITEM 7 AND 8 -
PIPES
INTAKE
SUBMARINE CABLE
ERIE AVE
6
2



NOTES

PROJECT DEPTHS AND SOUNDINGS ARE REFERRED TO LOW WATER DATUM, ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955) (INTERNATIONAL GREAT LAKES DATUM 1955)

$\bullet^{2}$ INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER

(32) INDICATES NEW DEPTH REQUIREMENTS

PLAN

SCALE OF FEET

900' 0 900' 1000' 1800'

600 FEET OF EAST BREAKWATER

600 FEET TO OUTER BREAKWATER

STING OUTER HARBOR

MODIFICATIONS AND CONVEYORS
HIPMENT AREA

ST BASIN

IVERSIDE PARK

CELLS

CELLS

ITEM 9 - SHEET PILE CELLS RIVER DIVERSION AND BRIDGE CONSTRUCTION

ITEM 10 - BANK CUT A WITH SHEET PILE PROTECTION

ITEM 11 - BANK CUT A WITHOUT SHEET PILE PROTECTION

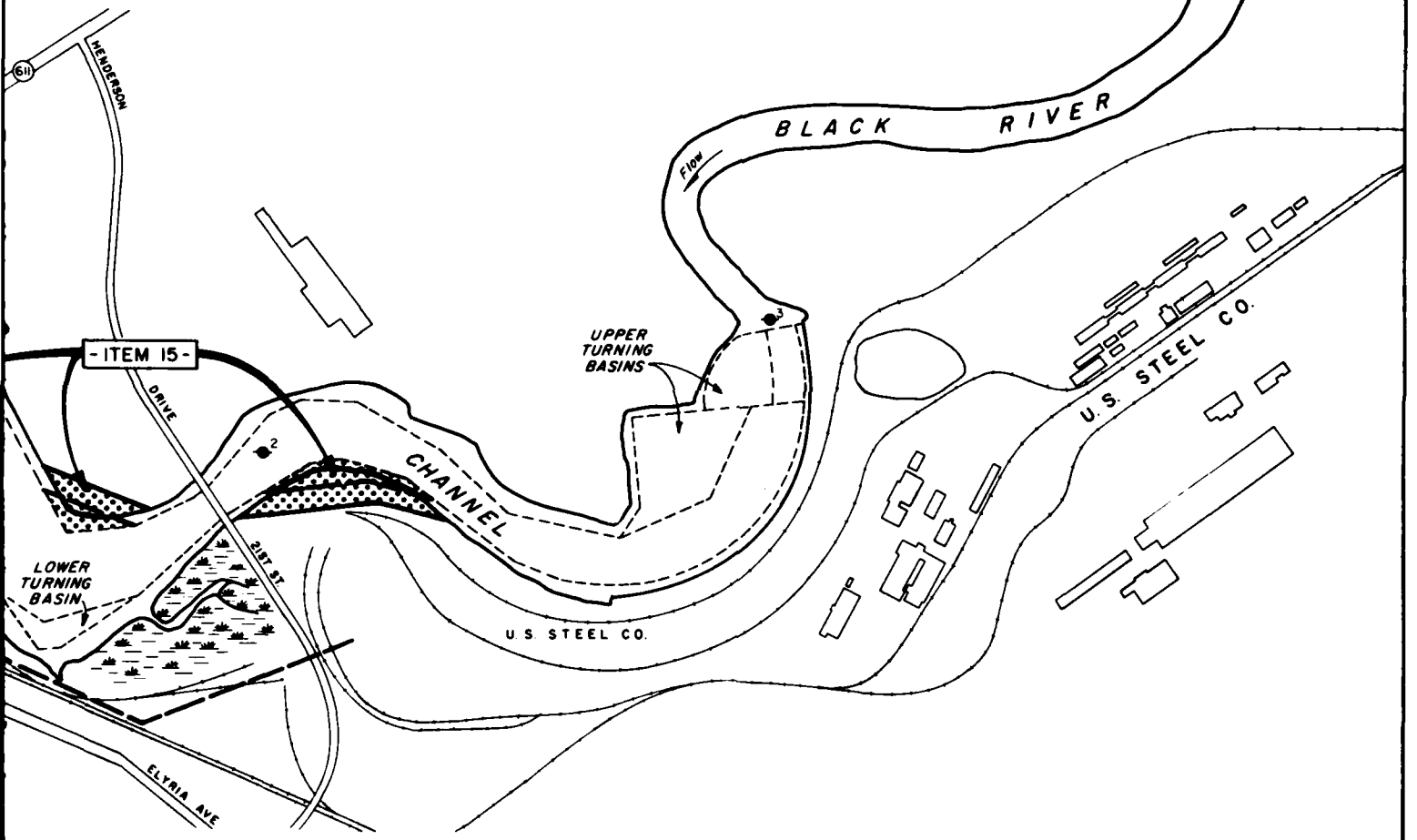
ITEM 12 - SHEET PILE BULKHEAD FOR SPECIAL PURPOSE VESSEL

ITEM 13 - TRANSSHIPMENT FACILITY WITH UPRIVER CONVEYOR

ITEM 14 - TRANSSHIPMENT FACILITY WITH SPECIAL PURPOSE VESSEL LOADOUT

ITEM 15 - BANK CUTS B, C AND D

ITEM 16 - BERM CONSTRUCTION - DIKED DISPOSAL AREA



NOTES

PROJECT DEPTHS AND SOUNDINGS ARE REFERRED TO LOW WATER DATUM, ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955) (INTERNATIONAL GREAT LAKES DATUM 1955)

●² INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER

(32) INDICATES NEW DEPTH REQUIREMENTS

LORAIN HARBOR, OHIO
LORAIN HARBOR STUDY

ALTERNATIVE NAVIGATION IMPROVEMENTS

U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1983

Technical Criteria.

a. A detailed geotechnical analysis of the project area was undertaken to more fully assess the soil properties and also to more accurately locate the top of rock to develop refined designs and cost estimates. This information resulted in a more detailed determination of common excavation versus rock excavation required in the portions of the harbor to be dredged and a more detailed design for the Riverside Park Cut alternatives. The results of this subsurface investigation are contained in Appendix A.

b. As a result of a meeting conducted by the District with Vessel Masters for the Cleveland Harbor Study on 8 April 1981, the design vessel speeds for Lorain Harbor were altered to conform to those established for Cleveland Harbor. Then speeds are considered to be a good representation of actual vessel speeds at Lorain Harbor, under design conditions. These new vessel speeds are displayed in Table 14.

c. Since dredging is a major component of the alternatives under consideration, the District conducted a study of possible disposal areas for both polluted and non-polluted material, in order to more accurately determine the costs for such disposal. This study concluded that polluted material would be disposed of in the existing diked disposal area. Non-polluted soft material and rock dredging would be disposed of in the open-lake disposal sites. The results of this study are contained in Appendix G and are briefly discussed below. The designation of whether a material is considered polluted or nonpolluted was based on test results obtained from EPA testing conducted in 1975, and Buffalo District testing conducted in 1981 (see Existing Conditions). Based on these studies it was concluded that the upper 2 feet of the material which would be removed during dredging and deepening would be classified as polluted.

d. As previously stated in the PROBLEM IDENTIFICATION Section the District is currently conducting a model test to more accurately determine vessel roll characteristics for 1,000-foot long vessels. The six plans detailed below have been designed for a 1,000-foot vessel rolling 4 degrees under design wind and wave conditions.

Economic Criteria - The benefits used to conduct the economic analysis, in the "Assessment and Evaluation of Preliminary Plans" section of this report, were based on a required design vessel clearance of 6.5 feet (requires channel depth to 32 feet LWD) for 1,000-foot vessels operating at Low Water Datum (LWD). For this situation, the vessels were assumed to "light-load" by 3 feet and transportation savings benefits were calculated assuming a fully loaded (25.5 feet) fleet under "with project" conditions.

For this Final Feasibility Report, economic benefits were calculated utilizing variable lake levels which represent actual water levels which are likely to reoccur in the future. A further discussion is provided below, regarding economic benefit evaluation utilizing variable lake levels.

Variable Lake Level Evaluation - In evaluating transportation savings benefits for variable lake levels one needs to understand how water levels in

the Great Lakes vary. The Great Lakes are subject to two types of fluctuations, the first being seasonal (annual) fluctuations and the second is cyclic fluctuations (long-term). For this analysis, monthly stage-duration curves were developed for all the potentially constraining points along the trade route for the 9-month navigation season (April through December). These curves were developed using the 77 years of available record and since they were developed for each month of the shipping season, they reflect both the seasonal fluctuations and cyclic fluctuations of the Great Lakes. Figure 4 shows the variation in seasonal lake levels relative to long-term monthly average stage in the trade route to Lorain Harbor (Lakes Superior, Michigan, Huron, and Erie).

The reason for conducting an alternative economic analysis is to determine transportation savings benefits based on long-term lake levels instead of Low Water Datum is illustrated in Figure 4. As shown in this figure, the long-term lake levels are usually above LWD at the destination harbor. Transportation companies determine the maximum cargo capacity for a vessel by identifying the most constraining point (i.e., minimum water depth) along the trade route. The maximum vessel drafts are then derived for each trip by maintaining a minimum safe clearance over this constraining point.

Since the long-term lake levels are generally above LWD, the shippers do take advantage of this additional water depth in determining vessel capacity which reduces their transportation costs per ton. In comparison to using LWD as the datum for computation of benefits, use of long-term lake levels results in smaller transportation savings benefits because the vessels can meet the required underkeel clearance in the lake approach channel more frequently during the season as a result of high water elevations at the destination harbor.

Estimated benefits will be larger under a "low water condition" scenario since the design criteria results in a persistant light-load condition which is eliminated by channel deepening. An analysis based upon variable lake levels reduces the amount of time for which benefits from providing design channel depths can be credited to the project since the long-term average water levels increase the capability of the existing 29-foot channel entrance to about 31 feet which is equal to the variation of average lake levels above low water datum for Lake Erie.

Environmental and Other Criteria - No change from criteria used in the Preliminary Feasibility Study.

Determination of Disposal Sites for New Work Dredging - As part of this FFR, a detailed investigation was conducted on nine alternative disposal sites for confining polluted material and on an open-lake site for deposition of nonpolluted soft and hard material. Due to the large quantities of materials requiring disposal, the financial impact of determining the least costly disposal site could be significant. A detailed presentation of this investigation is presented in Appendix G and is summarized below.

The investigation conducted for this study was an update of prior investigations conducted in 1968 and 1974 to locate sites for confined disposal areas,

in Lorain, OH, as an alternative to open-lake disposal. A total of 11 sites were evaluated for this study. Three of the sites were located adjacent to existing Outer Harbor breakwaters, two sites were located along the Black River, two sites were land sites, two were lakeshore sites not located adjacent to the harbor and the last two were the existing open-lake disposal sites for hard and soft materials. These sites were evaluated as to: (a) is the site still suitable for this purpose (acceptable to the locals), (b) does it have the required capacity to hold the estimated material quantities, and (c) what is the cost to develop this site.

In compliance with ER 1165-2-27, "Establishment of Wetland Areas in Connection with Dredging," the use of dredged material to establish wetland areas was also considered. However, this alternative was eliminated for various reasons. Wetland creation within the Black River would seriously encroach upon the navigation channel and, without costly protection, would probably be destroyed by boat wash. Given the commercial-industrial nature of the harbor area, no possible sites along the Inner or Outer Harbors were identified which would not be substantially altered by man-made causes such as filling and the intensification of land use. An area inside the West Breakwater was identified as a potential site for wetland creation. However, limited area, shallow depths, and the fact that this area is currently filling in naturally has eliminated this area from consideration.

Based on this assessment, it was concluded that modifying the existing Confined Disposal Area, located adjacent to the East Breakwater Shorearm, to contain this polluted new work, dredging would be the best site. This site would be the least costly, would not adversely affect the environment, and is socially acceptable. Of all the sites investigated for confining polluted dredged material, this site appears most appropriate.

For the disposal of nonpolluted hard and soft materials, the established lake disposal sites were considered the most appropriate and feasible sites. These sites have almost unlimited capacities and require no development costs.

Cost Sharing - This report will display two methods to determine the distribution of the construction costs between Federal and non-Federal interests. The first method will be the "Traditional Method" and the second will be the Administration's proposed policy.

For the Traditional Method, the Federal Government bears 100 percent of the costs for constructing the general navigation features consisting of breakwaters and jetties, entrance and, primary access channels, turning basins and anchorage areas. In addition, the Federal Government also operates and maintains the project. Non-Federal interests are responsible for and bear costs of terminal facilities; dredging in berthing areas and interior access channels thereto; acquisition of the necessary lands, easements, rights-of-way; spoil disposal areas with retaining dikes; and hold and save the Government free from damages. Local interests must also relocate and alter affected ultilities, pipelines, cables, and sewer outlets.

The Administration's proposed cost sharing policy would require that non-Federal interest reimburse the Federal Government for the entire cost for construction of navigation features of the recommended plan and all subsequent expenditures for operation, maintenance, and rehabilitation. This policy is subject to cost-sharing and financing arrangements with the responsible non-Federal agencies sponsoring the project which are satisfactory to the President and the Congress.

Incremental Justification of Project Features - Corps policy requires that separable project features of an alternative be incrementally justified, i.e., produce sufficient additional benefits to offset additional costs. Alternatives 9, 10, and 18 were developed as complete plans for more efficient upriver movement of goods. Input from local study participants indicated a desire to include a Riverside Park Cut feature on these alternatives in order to avoid congestion at the existing river mouth. It is required that the separable costs associated with the construction of the Riverside Park Cut feature (Alternatives 9A, 10A, and 18A) be offset by sufficient benefits, produced by this feature, to economically justify its construction.

These criteria of separable costs and incremental justification also applies to Alternative 18 and 18A with regards to the upriver bend widenings. The Outer Harbor modifications associated with these alternatives would allow access to the lakefront by 1,000-foot vessels. However, the upriver bend widening required by these plans would allow the most probable maximum-sized vessels for upriver trade (Class 8) to operate at deeper drafts. Therefore, the separable cost associated with providing the upriver bend widening must be offset by a proportional increase in benefits due to the increase in draft.

The incremental justification of these project features is presented in the economic evaluation for each alternative.

Cost Apportionment for Alternatives 18 and 18A - Alternatives 18 and 18A involve a different fleet mix (1,000 and 767-foot vessels) than was considered for Alternatives 9, 9A, 10, and 10A (these only considered 1,000-foot vessels). For Alternatives 18 and 18A the Lorain Pellet Terminal and Amship Co. would be the harbor users utilizing 1,000-foot vessels in the Outer Harbor. U.S. Steel would be the only initial user involved in direct upriver delivery in 767-foot vessels. For this reason, a discussion regarding the single user/multiple user aspects of this new fleet mix and the required navigation improvements is pertinent in order to determine if Federal interest exists and to determine appropriate cost apportionment.

The following table, Table 33A, is an excerpt from ER 1105-2-20 which summarizes the current traditional cost sharing policy for commercial navigation projects. This applies as well to separable or incremental features of an overall plan or project proposal. The Outer Harbor improvements proposed for these two alternatives - harbor deepening and breakwater changes - would qualify as multiple user components since both lakefront iron ore and upriver traffic would benefit from harbor deepening, and breakwater changes would also aid two major users (Republic Steel and Amship). However, the upriver

bend cuts included in Alternatives 18 and 18A appear to benefit only U.S. Steel at this time.

These 767-foot vessels are self-unloading vessels which can accommodate other dry bulk commodies such as limestone, crushed stone, coal, salt, etc. Although there are no other current dock operators along the Black River utilizing this class of vessel. Several factors currently exist which would contribute to potential multiple use of this vessel.

Large areas on the east bank of the Black River, adjacent to the Federal channel, are vacant and would be developed in the future. The existing surface transportation network in the vicinity of the Federal project provides excellent access to these vacant areas which could be developed into a number of heavy or light manufacturing land uses.

There are also several construction aggregate operations (including Griffith Blacktop, Inc.) that have received substantial annual volumes of crushed stone products that could utilize 767-foot dry bulk carriers in the future. The largest of these companies now receives its stone products from an upper Great Lakes port which cannot load vessels greater than 625 feet in length. However, use of the longer 767-foot vessel may create the potential for a shift in its current method of obtaining its raw materials.

Another factor which might expand the number of dock owners which could use the U.S. Steel fleet is the recent reorganization of their corporate structure in order to be more competitive against nonsteel fleet operators for dry bulk commodity movements. The reorganization has made the U.S. Steel fleet available for charter (reference letter of 7/27/81 in Appendix D).

Since these upriver bend cuts are a modification to an existing channel within the defined limits of the current Federal project and since there is a reasonable prospect of future users in this upriver area, the degree of Federal participation is 50 percent of the initial construction cost for this feature. This implies that non-Federal interest would contribute 50 percent of the annual costs for interest and amortization of the first cost of this component until "acceptable multiple use commences."

Table 33a - Single User Cost-Sharing Policy
Commercial Navigation Project

Category of Project	Initial Use	Prospective Future Use	Degree of Federal Participation: Initial Construction (1)	Degree of Federal Participation: Operation and Maintenance
New channel or extension or modifications to existing channel	Single-user only (2)	Exclusive Single-user	None (2)	None (2)
New channel or extension to existing channel	Single-user	Reasonable prospect additional users	50 % (3)	50% (4)
Modification (5) to existing channel	Modification increment single-user	Reasonable prospect additional users	50% (3)	100%
Modification (6) progressive development	-	-	100%	100%
Assumption of (7) Non-Federal Project	Single-user	Reasonable prospect additional users	None	None (8)
Assumption of (7) Non-Federal Project	Multiple-use	Multiple-use	None	100% (9)

FOOTNOTES:

(1) Federal cost participation in the construction and maintenance of the navigation waterway improvement provides for general public use. Users or others provide related facilities such as berthing areas, docks, terminal and transfer facilities, and local access channels to wharfside and berths.

(2) Single commercial entity receiving exclusive benefit or shipment and/or receipt of commerce via waterway improvement. The single user determination lies in the identity of a single shipper or receiver, rather than the carrier of the commerce. No Federal participation will be recommended for an improvement where restrictive conditions of any sort (i.e., topography, ownership, laws, etc.) would permit the single private user the exclusive present and future enjoyment of the benefits from the improvement, so that the improvement would not be capable of serving more than the one user. This would be the case where one commercial entity controls all the land, giving access to the navigation improvement.

(3) Non-Federal interests pay 50 percent of the annual charges for interest and amortization of the first cost of general navigation component until acceptable multiple user comences.

(4) Non-Federal interests pay 50 percent of maintenance cost until acceptable multiple use commences. Thereafter, maintenance costs are borne by the Federal Government.

(5) Enlargement, realignment, or other betterment of existing Federal navigation project involving increase in project depth and/or width.

(6) Progressive development includes nominal incremental extension "end of the line" situations where part of the improvement is a last project increment reaching a last additional user. The last user may be "at the end" in terms of lenght, depth, or width, necessitating some project investment in his service alone. This is treated as multiple use unless disproportionate incremental investment is required.

(7) Waterway previously constructed by non-Federal interests.

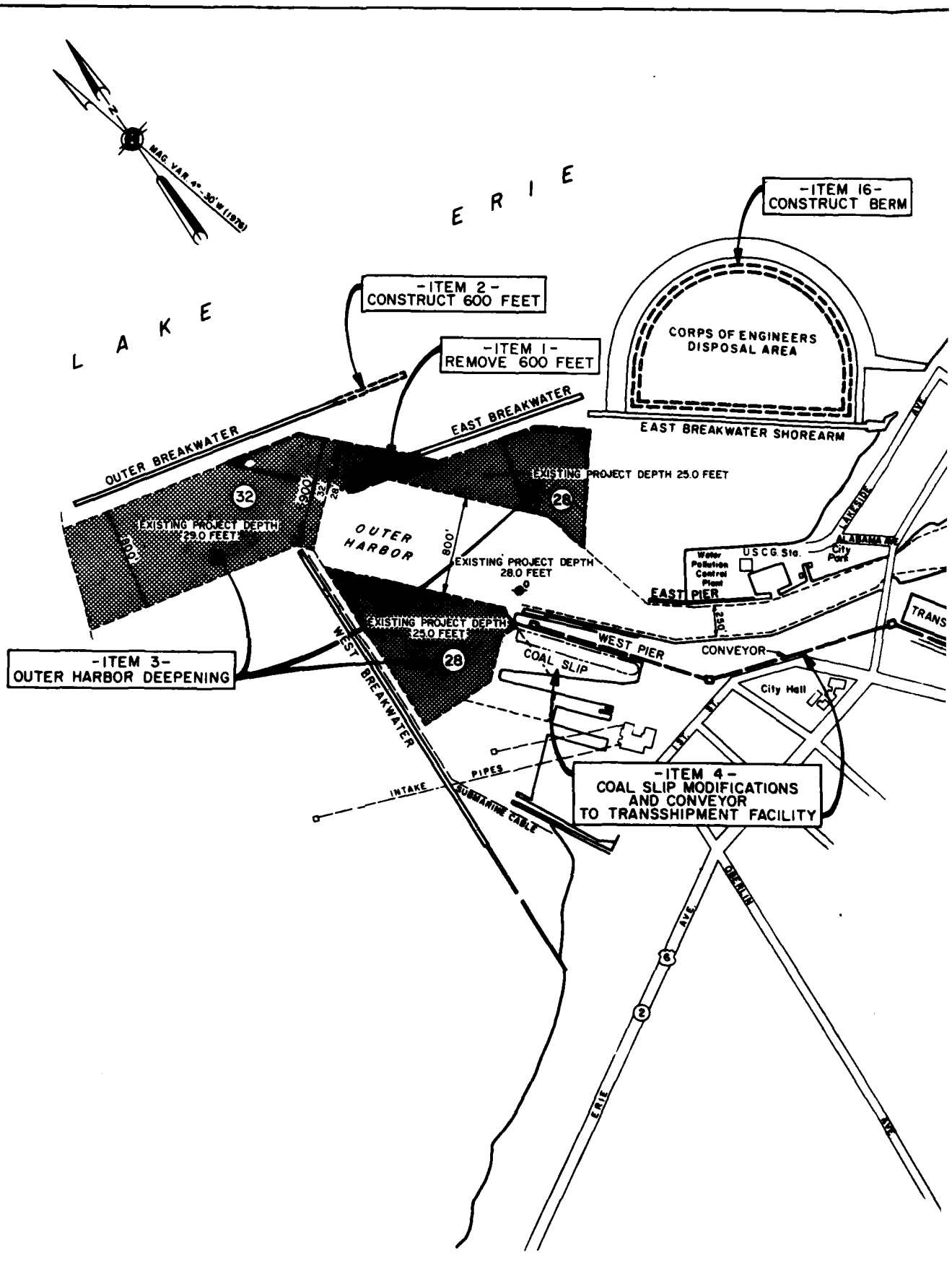
(8) Prior multiple use is a requirement for Federal assumption of maintenance responsibility. Federal assumption of maintenance must be specifically authorized by Congress.

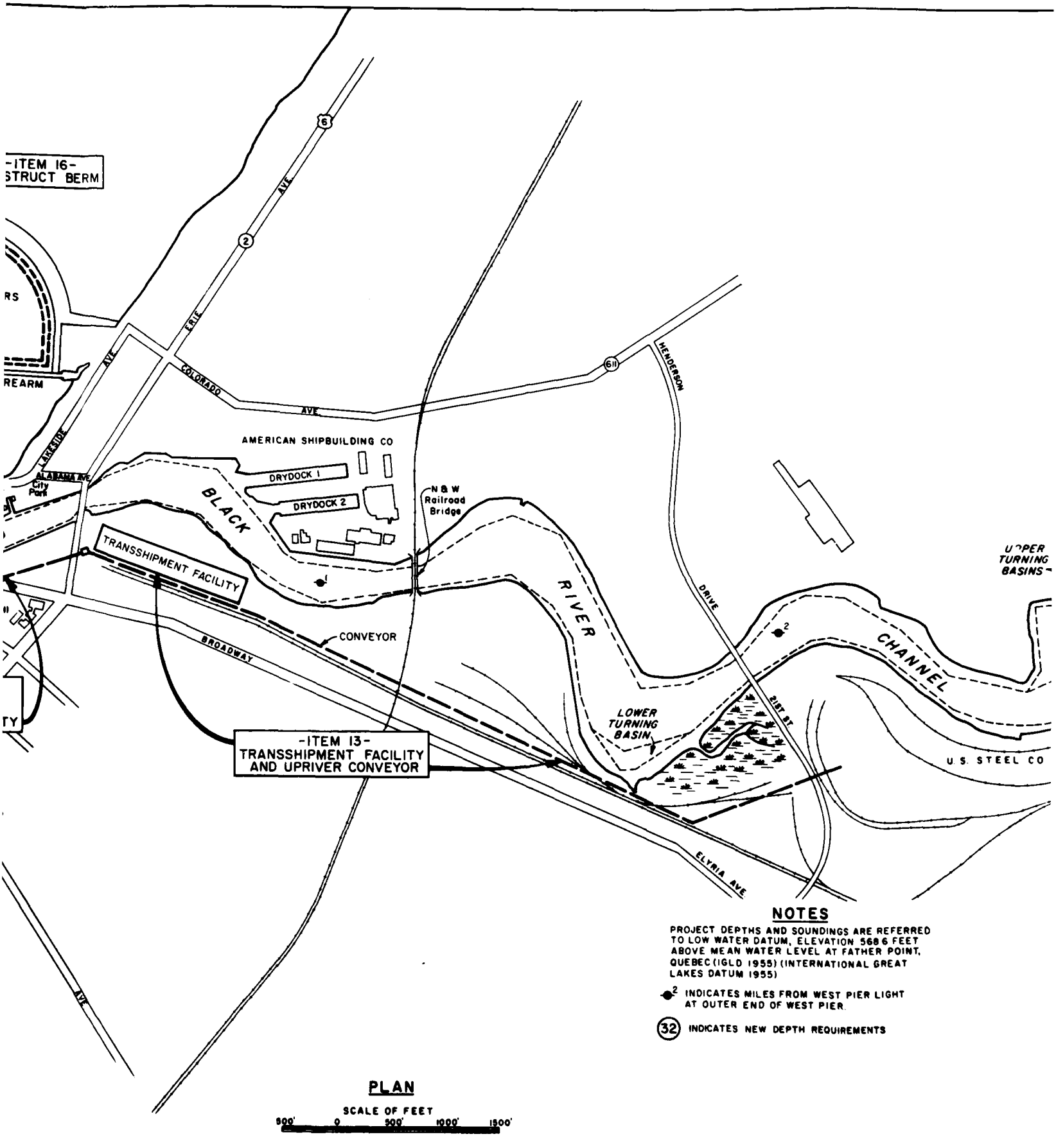
(9) Non retroactive. No Federal reimbursement for prior local expenditures. Federal assumption of maintenance must be specifically authorized by Congress.

ALTERNATIVE 9 (LAKEFRONT TRANSSHIPMENT - CONVEYOR UPRIVER)

Description of Alternative 9 - This plan remains essentially unchanged from that plan presented in preliminary planning. This alternative would provide upriver iron ore movement to U. S. Steel from a lakefront transshipment facility capable of accomodating 1,000-foot vessels. This facility would be located in the coal slip just west of the west pier. This alternative would improve harbor entrance conditions to permit safer and more efficient operation of 1,000-foot vessels to existing lakefront facilities and would provide a transshipment facility for delivery of iron ore to U. S. Steel by conveyor. The construction items and features associated with this alternative are shown on Plate 23.

Lakefront navigation improvements would include removal of 600 lineal feet of the East Breakwater (Construction Item 1) and an equal lengthening of the shoreward end of the outer breakwater (Construction Item 2). These changes in the breakwater configuration would widen the entrance channel from 550 feet to 900 feet at its narrowest point. The lake approach channel would be deepened 3 feet, to a depth of 32 feet, and the Outer Harbor turning basins would be extended and deepened by an additional 3 feet (Construction Item 3). This alternative would use an inactive coal slip for the berthing area for the transshipment facility. This area of the Outer Harbor is sufficient to accommodate the transshipment facility for Alternative 9 and the Lakefront


MAG. VAR. 4° 30' W (1978)
LAKE ERIE
-ITEM 16-
CONSTRUCT BERM
-ITEM 2-
CONSTRUCT 600 FEET
-ITEM 1-
REMOVE 600 FEET
CORPS OF ENGINEERS
DISPOSAL AREA
EAST BREAKWATER SHOREARM
OUTER BREAKWATER
EAST BREAKWATER
EXISTING PROJECT DEPTH 25.0 FEET
EXISTING PROJECT DEPTH
29.0 FEET
OUTER
HARBOR
EXISTING PROJECT DEPTH
28.0 FEET
EXISTING PROJECT DEPTH
25.0 FEET
-ITEM 3-
OUTER HARBOR DEEPENING
WEST BREAKWATER
WEST PIER
CONVEYOR
COAL SLIP
EAST PIER
Water Pollution Control Plant
U.S.C.G. Sta.
City Park
City Hall
PIPES
INTAKE
SUBMARINE CABLE
-ITEM 4-
COAL SLIP MODIFICATIONS
AND CONVEYOR
TO TRANSSHIPMENT FACILITY
ERIE AVE.
ALABAMA AVE.
LAKESIDE AVE.



NOTES

PROJECT DEPTHS AND SOUNDINGS ARE REFERRED TO LOW WATER DATUM, ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955) (INTERNATIONAL GREAT LAKES DATUM 1955)

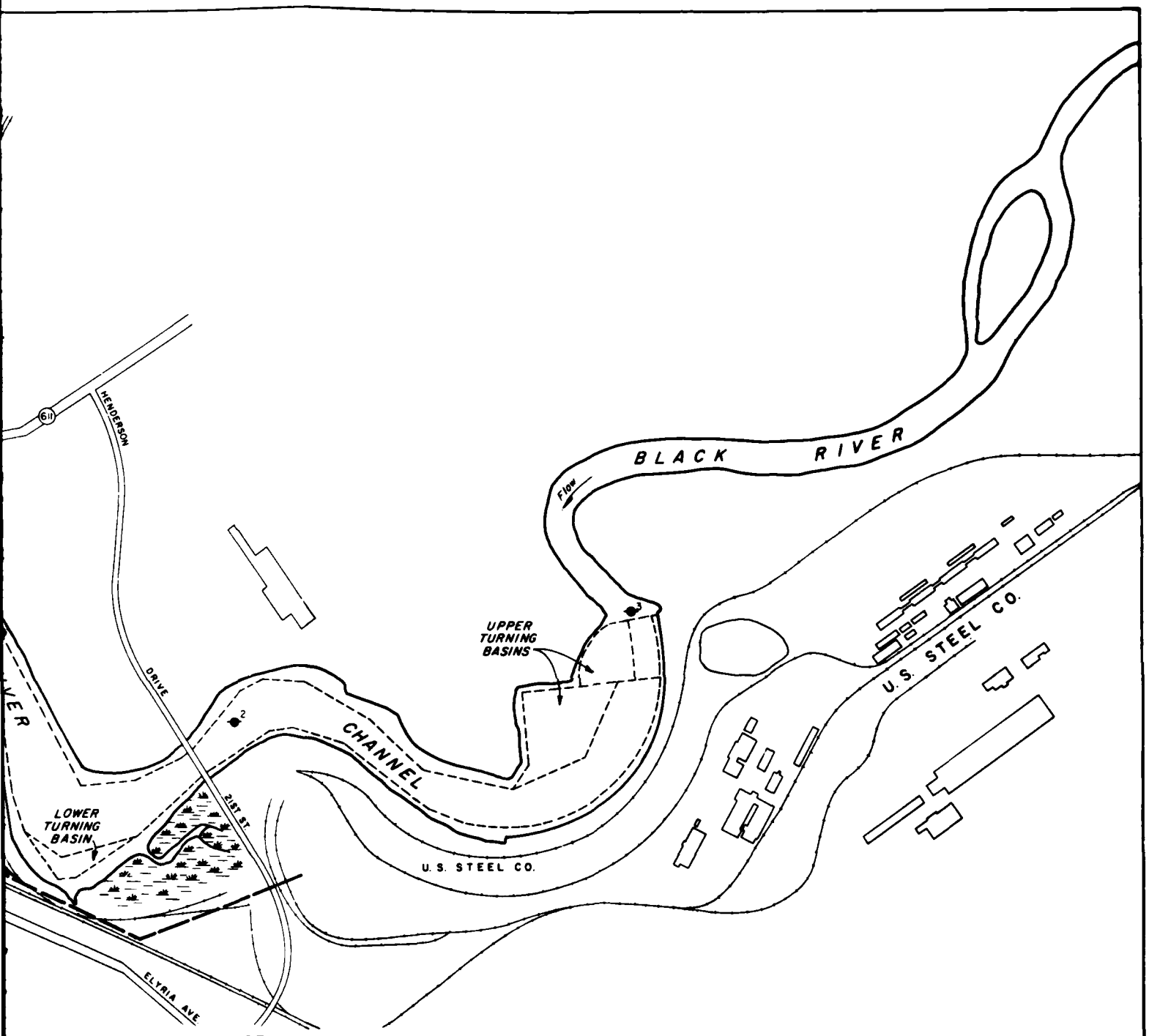
●² INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER.

(32) INDICATES NEW DEPTH REQUIREMENTS

PLAN

SCALE OF FEET

900' 0 500' 1000' 1500'



NOTES

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●² INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER.

(32) INDICATES NEW DEPTH REQUIREMENTS

LORAIN HARBOR, OHIO
LORAIN HARBOR STUDY

ALTERNATIVE 9
LAKEFRONT TRANSSHIPMENT-CONVEYOR UPRIVER

U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1983

transshipment facility recently constructed by Republic Steel Corporation that serves steel plants in Cleveland and other plants in the Warren/Youngstown region of Ohio. The east side of the coal slip was selected as the wharf for the proposed off-loading facility and would require renovation and structural modifications to render it suitable for a docking facility (Construction Item 4). The coal slip area would also require dredging to enable berthing of 1,000-foot vessels. For this alternative, a conveyor system would be used to transport the off-loaded iron ore upriver to the U. S. Steel Plant. The system would be fed by a dock hopper constructed on the west pier which would receive the shipments and direct the material flow to a transshipment facility located immediately upstream of the Erie Avenue bridge. Approximately 1,500 lineal feet of enclosed conveyor construction would be required to bypass Republic's pellet storage piles and 30 lineal feet of tunnel would be necessary to pass a below-grade rail crossing. From the transshipment facility, the conveyor system would meander upriver, pass beneath the approach ramp to the 21st Street Bridge and terminate at U. S. Steel (Construction Item 13). Elevated structures would be required to bridge East Ninth Street and the N&W Railroad tracks. The conveyor would be enclosed for safety and to diminish noise and air pollution. Dust collection systems would be provided at transfer points. This alternative would also require construction of a berm in the existing diked disposal area (Construction Item 16) for disposal of polluted material.

Cost Estimate for Alternative 9 - The summary estimate of first cost for Alternative 9 is contained in Table 34. A detailed breakdown of the cost estimate is contained in Appendix C. This estimate was developed to determine economic feasibility and to delineate cost sharing. This table displays both the traditional cost-sharing allocation (100 percent Federal for construction of general navigation features) as well as the President's proposed cost allocation which calls for 100 percent financing by non-Federal interests. As shown, the total estimated cost for this alternative is $70,167,000. For the Traditional Cost Allocation method $17,974,000 would be Federal expense and $52,193,000 would be non-Federal. For the President's Proposed Cost Allocation method the entire $70,167,000 would become a non-Federal expense.

Table 35 presents the average annual charges for Alternative 9 for both the traditional and proposed cost sharing methods, the total investment for this plan is $77,967,000. Including operation and maintenance and future replacement costs the total annual changes for this plan are $7,325,000.

Economic Evaluation of Alternative 9 - A detailed discussion of the projected benefits that would be realized from implementing Alternative 9 is presented in Appendix B "Economic Evaluation". Benefit categories applicable to Alternative 9 are savings from reduced upriver iron ore and limestone transportation costs, and savings derived from reduced lakefront iron ore transportation costs.

Table 34 - Estimate of First Cost - Alternative 9 (1)

Construction Item	Total Cost	Traditional Cost Apportionment (2)		Proposed Cost Apportionment (3)	
		Federal	Non-Federal	Federal	Non-Federal
	$	$	$	$	$
1. Removal of 600 feet of East Breakwater	2,128,000	2,128,000	-	-	2,128,000
2. Construct 600 feet to Outer Breakwater	3,297,000	3,297,000	-	-	3,297,000
3. Dredging Outer Harbor	9,976,000	9,976,000	-	-	9,976,000
4. Coal Slip Modifications and Conveyor to Transshipment Facility	10,276,000	-	10,276,000	-	10,276,000
13. Transshipment Facility with Upriver Conveyor	32,665,000	-	32,665,000	-	32,276,000
16. Berm Construction Diked Disposal Area	121,000	-	121,000	-	121,000
Subtotal	58,463,000	15,401,000	43,062,000	-	58,463,000
Engineering and Design	4,677,000	1,232,000	3,445,000	-	4,677,000
Supervision and Administration	5,157,000	1,341,000	3,816,000	-	5,157,000
Lands	1,870,000	-	1,870,000	-	1,870,000
Total First Cost	70,167,000	17,974,000	52,193,000	-	70,167,000

(1) December 1981 price levels.
(2) Costs for general navigation features (Items 1, 2, and 3) are 100 percent Federal.
(3) Total cost of construction is 100 percent non-Federal.

Table 35 - Estimated Investment Cost and Annual Charges - Alternative 9

Item	Total Project Cost (1)	Traditional Cost Apportionment (4)		Proposed Cost Apportionment (5)	
		Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	$	$	$	$	
Total First Costs, Excluding Lands	68,297,000	17,974,000	50,323,000	0	68,297,000
Interest During Construction	7,800,000	2,050,000	5,750,000	0	7,800,000
Lands	1,870,000	0	1,870,000	0	1,870,000
Total Investment, Including Lands	77,967,000	20,024,000	57,943,000	0	77,967,000
Annual Charges for the Project:					
Amortization (2)	6,099,000	1,566,000	4,533,000	0	6,099,000
Operation & Maintenance	739,000	310,000	429,000	0	739,000
Future Replacements (3)	487,000	0	487,000	0	487,000
Total Annual Charges	7,325,000	1,876,000	5,449,000	0	7,325,000

(1) December 1981 Price Levels.
(2) 7-5/8 percent interest rate, 50-year life, amorization factor is 0.07823.
(3) Future replacements consist of the average annual value of future investments in limited life cycle plan components.
(4) Costs for general navigation features are 100 percent Federal.
(5) Total cost of construction is 100 percent non-Federal.

Category	Average Annual Benefit (1)
	$
Upriver Iron Ore	9,839,000
Upriver Limestone	165,000
Lakefront Iron Ore	2,711,000
Total Benefits	12,715,000

(1) December 1981 prices.

Table 36 summarizes the average annual benefits, the average annual charges, the net average annual benefits and the benefits cost ratio.

Table 36 - Summary of Benefits and Costs - Alternative 9 (1)

	Average Annual Benefits (1)	Average Annual Changes	Net Average Annual Benefits	Benefit/Cost Ratio
	$	$	$	
Total Project:	12,715,000	7,325,000	5,390,000	1.7

(1) December 1981 Price Levels.

Environmental Features/Assessment of Alternative 9 - Removal of 600 feet of the East Breakwater would expose approximately 0.69 acre of substrate composed of silt, rock and some exposed bedrock which could provide aquatic habitat, while a 600-foot addition to the Outer Breakwater would cover approximately 1.02 acres of substrate composed of silt, rock, and some exposed bedrock which had provided aquatic habitat. The breakwater extension would be constructed of cellular steel sheetpile with rubblemound toe protection. This stone would provide 0.56 acre of colonizable aquatic habitat. Removal of 600 feet of the east breakwater, also constructed of cellular steel sheet pile with rubblemound toe protection, would remove approximately 0.20 acre of colonizable aquatic habitat provided by this stone. The bottom habitat described here is of low value due to seriously degraded water quality, deep depths and disturbances from commercial navigation. Therefore, impacts from removal and extension of the breakwaters would be minimal. Still, a moderately diverse fish community persists in Lorain Harbor. The amount of habitat provided and destroyed is summarized in the following table:

	Habitat Provided	Habitat Removed
Remove 600 feet of East Breakwater	0.69 Acre	0.20 Acre
Add 600 feet to Outer Breakwater	0.56 Acre	1.02 Acre

Dredging the Outer Harbor an additional 3 feet would result in 380,000 cy of polluted dredged material and 760,000 cy of nonpolluted dredged material for a total of 1,140,000 cy. Polluted material would be disposed of at the

existing diked disposal site. Nonpolluted material would be disposed of at a designated open-lake site. Dredging would temporarily disrupt bottom habitat and increase turbidity and sediment load of the Outer Harbor waters. Since most of this area is already periodically dredged, (approximately once each year) no significant impacts are expected. However, according to the United States Fish and Wildlife Service (USFWS - see Appendix F) approximately 70 acres of previously undredged bottom habitat would be dredged to enlarge the turning areas. The conversion of relatively shallow, undisturbed areas into deep, annually dredged areas would decrease the spawning potential of the areas, reduce the benthic production of the areas, and reduce the annual fish biomass production of the areas.

Reorientation of the Outer Harbor entrance channel would allow the larger vessels to easily and safely steer into position to move into the transshipment facility. However, during construction, the presence of heavy equipment during this reorientation may have negative aesthetic impacts on the West Breakwater Lighthouse, a structure listed on the National Register of Historic Places. Also, sight lines from the shore to the lighthouse may also be temporarily obstructed.

Increasing the height of the CDF from +8 to 15 LWD to contain the additional dredged material would have a short-term, adverse impact on aesthetic quality with respect to the view of Lake Erie from the shore. Immediately after filling, the CDF would not be accessible to the general public and thereby serve only as an unlandscaped obstruction with regard to viewing Lake Erie from the shoreline. Since bluff heights at the shore are approximately 25-30 feet, however, a vista beyond the facility would still be available. After the city of Lorain's proposed park development is completed, the man-made headland would significantly improve the area's aesthetic quality, both as increased parkland and as a scenic overlook from which to view the lake environment and harbor activities.

Temporary noise and air pollution would be experienced during construction. However, since this is a highly industrialized area, the effects should be minimal.

This alternative would use an existing, but inactive coal slip for the berthing area for the transshipment facility. The east pier of the coal slip would require renovation and structure modification to render it suitable for a docking facility. No major impacts are expected. The coal slip area would also require dredging to enable berthing of 1,000-foot vessels (amounts included in Outer Harbor quantities).

The conveyor system meandering upriver to U.S. Steel from the coal dock immediately west of the mouth of the Black River would pass through primarily commercial and industrial land. Therefore, environmental impacts would be minimal. No people or farms would be displaced. Approximately 1,500 lineal feet of enclosed conveyor construction would be required to bypass Republic's pellet storage piles and an additional 30 lineal feet of tunnel would be necessary to pass a below-grade rail crossing. The conveyor would require elevated structures to bridge across East 9th Street and to bridge over a N&W Railroad tracks. This could create a negative aesthetic impact, since the

conveyor would be in plain view. At ground level, the conveyor would be enclosed by a prefabricated metal building for safety and to diminish noise and air pollution. Dust collection systems would be provided at each transfer point. This alternative would require the acquisition of land or rights-of-way for the conveyor for the 3-mile length of the Black River. It would also require modification to U.S. Steel's present method of receipt of iron ore. The area where the transshipment facility and storage piles would be located (west bank, upstream of the Erie Avenue Bridge) is presently vacant, sparsely vegetated land. Except for the possible negative aesthetic impact of additional storage piles in the area, no major impacts are expected. Since the vessels would be docked at the lakefront and the ore conveyored upstream, traffic downtown would experience less congestion due to fewer bridge openings of the Erie Avenue Bridge. Also, vessel congestion at the river mouth would be lessened since U. S. Steel's vessels would no longer have to pass Republic Steel's vessels unloading at their pellet terminal.

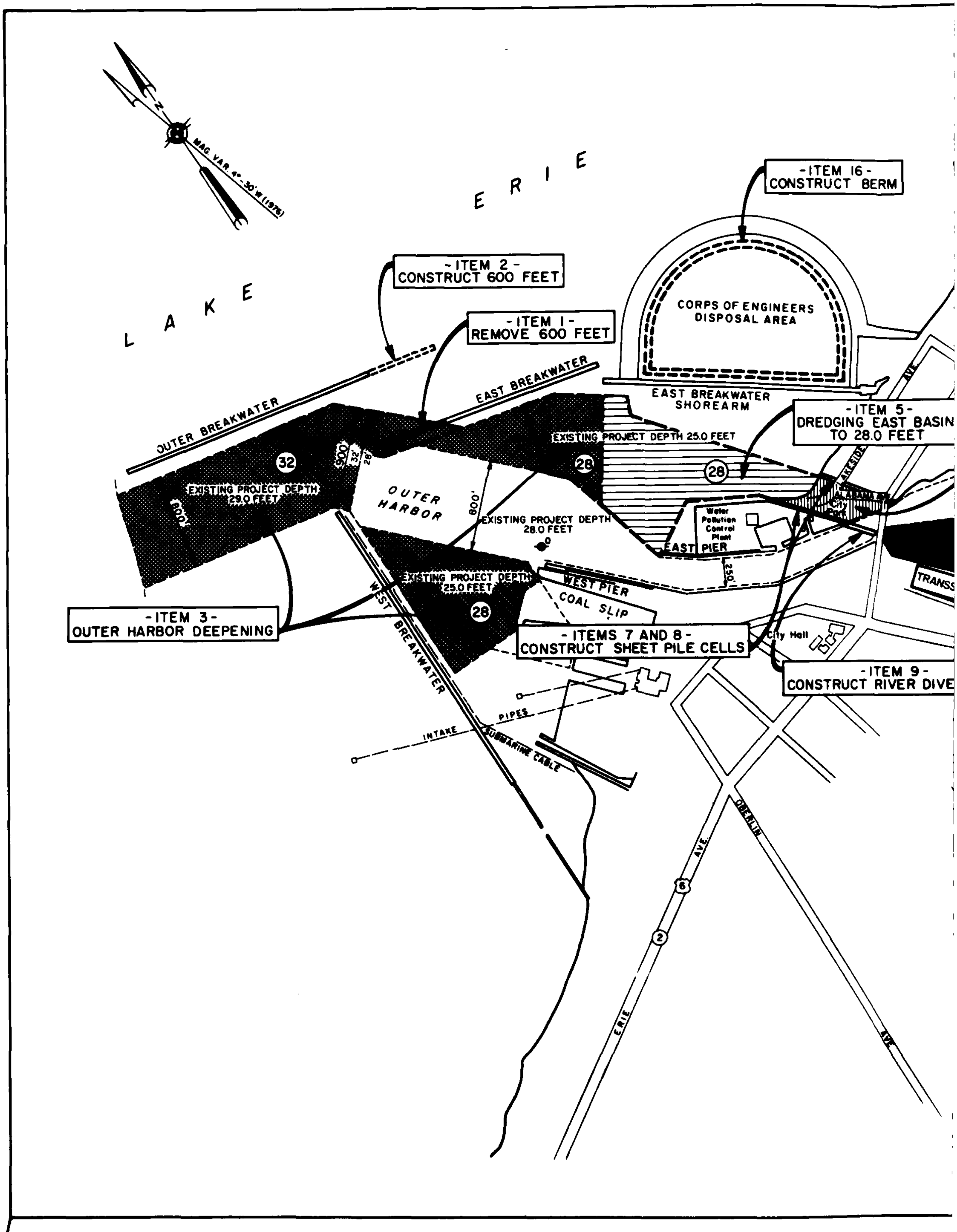
No significant increases in tax revenues or property values are expected. There would be a short-term increase in employment during construction. Businesses providing support facilities for the conveyor system would increase in number thereby, increasing employment. No significant impacts on regional or community growth are expected, however, the harbor improvements may facilitate expansion of the U. S. Steel plant.

Evaluation of Alternative 9 - With a benefit/cost ratio of 1.7 and with *no major adverse environmental impacts expected it is concluded that* Alternative 9 warrants further consideration as the selected plan for commercial harbor improvements.

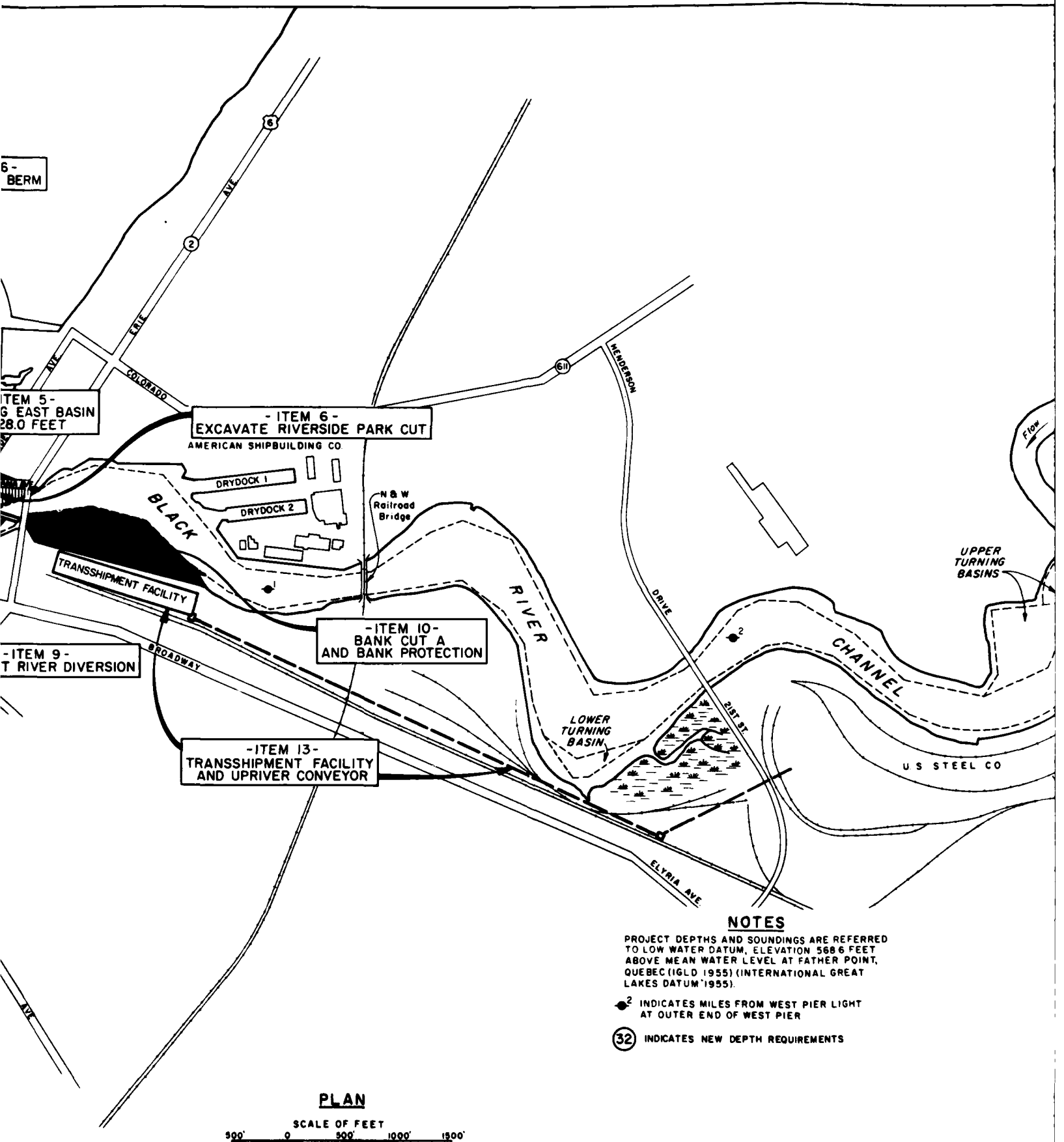
Implementability of Alternative 9 - Based on engineering, economic, and environmental criteria, Plan 9 is implementable. However, because of U. S. Steel's recently stated position that they expect to use 767-foot X 72-foot ore boats to service the Lorain plant for the foreseeable future, the institutional and functional viability of Alternative 9 is questionable at this time. As discussed near the end of the next section, "Comparison of Detailed Plans," further coordination with local interests is required prior to reaching a definitive conclusion on implementability of Alternative 9.

ALTERNATIVE 9A (RIVERSIDE PARK CUT WITH TRANSSHIPMENT UPRIVER BY CONVEYOR FROM ERIE AVENUE BRIDGE)

Description of Alternative 9A - This plan is essentially the same as Alternative 9 except that this plan includes the incremental feature of the Riverside Park Cut which would allow 1,000-foot vessels to dock directly at a new transshipment facility located immediately upstream of the Erie Avenue Bridge. This plan would eliminate the need for the coal slip improvements and the conveyor from the lakefront to the transshipment facility associated with Alternative 9. Passage through the Erie Avenue Bridge would be facilitated by construction of a new navigation channel through Riverside Park which would provide a straight channel through the bridge. The construction features of this plan are displayed on Plate 24.



MAG. VAR. 4°-30'W (1976)
LAKE ERIE
-ITEM 16-
CONSTRUCT BERM
-ITEM 2-
CONSTRUCT 600 FEET
-ITEM 1-
REMOVE 600 FEET
CORPS OF ENGINEERS
DISPOSAL AREA
EAST BREAKWATER
EAST BREAKWATER
SHOREARM
OUTER BREAKWATER
-ITEM 5-
DREDGING EAST BASIN
TO 28.0 FEET
EXISTING PROJECT DEPTH 25.0 FEET
32
28
EXISTING PROJECT DEPTH
29.0 FEET
OUTER
HARBOR
800'
900'
32'
28'
EXISTING PROJECT DEPTH
28.0 FEET
Water
Pollution
Control
Plant
EAST PIER
LAKESIDE
AVE.
ALABAMA ST.
City
Port
TRANSS
EXISTING PROJECT DEPTH
25.0 FEET
WEST PIER
COAL SLIP
250'
-ITEM 3-
OUTER HARBOR DEEPENING
- ITEMS 7 AND 8 -
CONSTRUCT SHEET PILE CELLS
City Hall
-ITEM 9-
CONSTRUCT RIVER DIVE
WEST BREAKWATER
INTAKE
PIPES
SUBMARINE CABLE
OBERLIN
AVE.
AVE.
ERIE
6
2



NOTES

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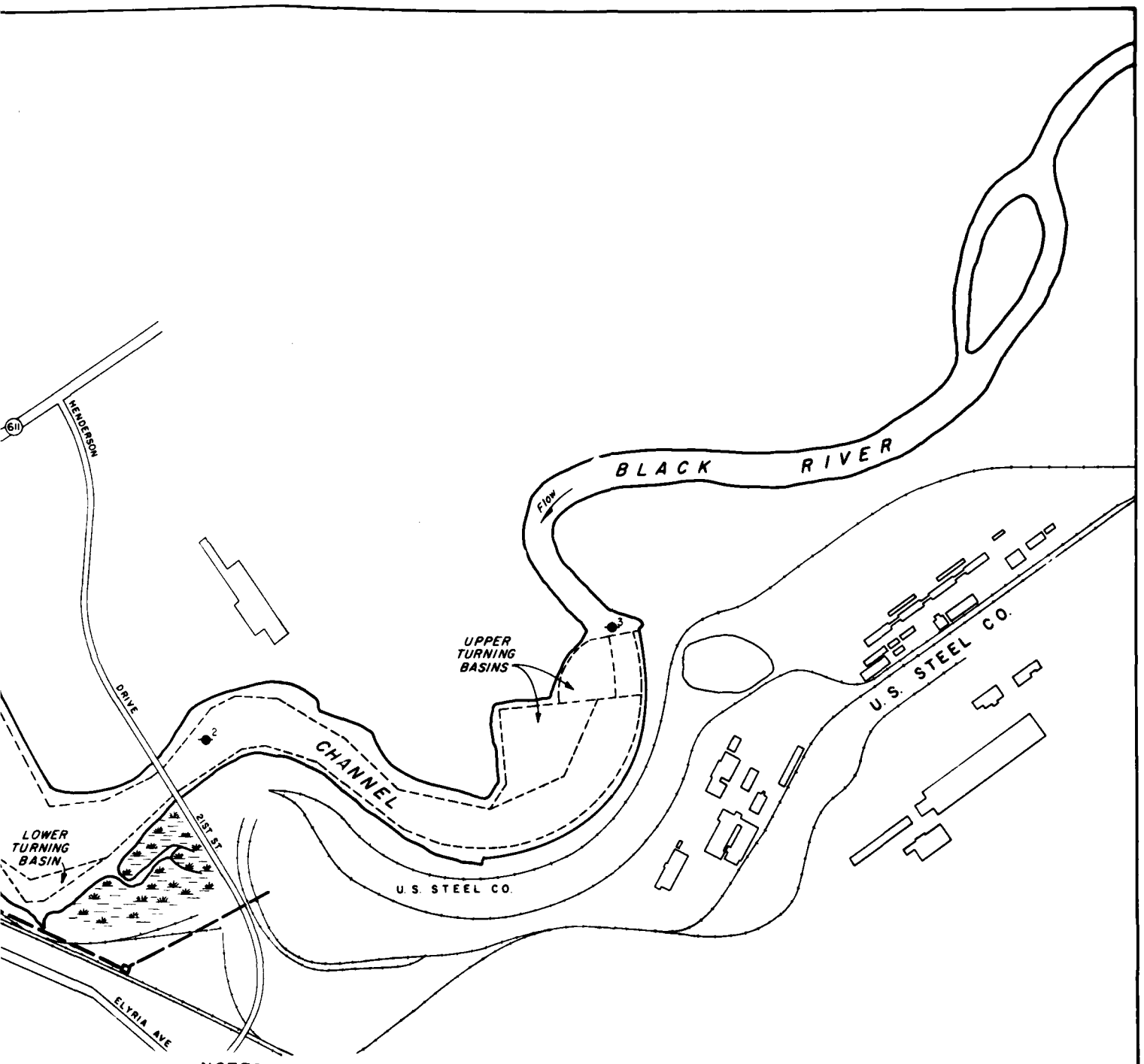
●² INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER

(32) INDICATES NEW DEPTH REQUIREMENTS

PLAN

SCALE OF FEET

500' 0 500' 1000' 1500'



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●^{2} INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER.

(32) INDICATES NEW DEPTH REQUIREMENTS

LORAIN HARBOR, OHIO
LORAIN HARBOR STUDY
ALTERNATIVE 9A

RIVERSIDE PARK CUT CONVEYOR UPRIVER

U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1983

Similarities between Alternatives 9A and 9 involve modifications to the outer and east breakwaters to provide a wider entrance channel for 1,000-foot vessels, (Construction Items 1 and 2) and required Outer Harbor deepening (Construction Item 3). This alternative would also require construction of an enclosed conveyor system to transport iron ore from the transshipment facility upriver to U.S. Steel's facilities (Construction Item 13). A berm would have to be constructed at the existing diked disposal area in order to accomodate polluted dredged material (Construction Item 16).

Associated with the Riverside Park cut feature of this alternative and the ability of Class 10 vessels to dock directly at the transshipment facility, the following additional construction items would be required. Dredging to a depth of 28 feet would be required in the Eastern Outer Harbor Basin

CONTINUE ...

(Construction Item 5) to provide a new channel approach to the new river entrance which would be located through Riverside Park. The park cut itself would be 300 feet wide and about 600 feet long (Construction Item 6). Also, a sheetpile cell wall would be constructed in the existing river channel, just downstream of the park cut, to provide access to the Coast Guard Station and the treatment plant and also to divert river flows through the new channel (Construction Item 9). Gaps would be provided in these cells to provide a flushing action in the old river mouth. Excavation and bulkhead loading of the land area just upstream of the Erie Avenue Bridge would be required to allow 1,000-foot vessels to dock and discharge their loads at the transshipment facility (Construction Item 10), and not hinder other river traffic.

Cost Estimate for Alternative 9A - The summary estimate of first cost and cost allocations for Alternative 9A is contained in Table 37. A detailed cost estimate for this alternative is contained in Appendix C. As shown, the estimated first cost for this alternative is $97,522,000. For the Traditional Cost Allocation Method, the Federal share would be $49,106,000 and the non-Federal share would be $48,416,000. Under the President's proposed cost-sharing, non-Federal interests would finance the entire cost of $97,522,00 as shown on Table 37. Table 38 presents the average annual charges for Alternative 9A for both the Traditional and President's Proposed cost-sharing methods. The total annual charges including annual operations and maintenance and future replacement costs for this plan are estimated to be $10,271,000.

Economic Evaluation of Alternative 9A - Alternative 9A is essentially the same plan as Alternative 9 except that it contains the separable feature of the Riverside Park Cut. The economic evaluation of this alternative will consist of two segments. First, the evaluation will address the economic justification of the entire project. Secondly, it will deal with the economic feasibility of the separable feature of the Riverside Park Cut. This means that the additional costs associated with the construction of the park cut needs to be offset by an equal increase in benefits.

For the evaluation of the total project, the total investment cost for Alternative 9A is $108,422,000, as shown in Table 38. Amortizing this cost over the 50-year project life and including annual operation and maintenance and future replacement costs, the total annual charges for this plan are $10,271,000.

Category	Average Annual Benefit (1)
	$
Upriver Iron Ore	10,698,000
Upriver Limestone	165,000
Black River Congestion	680,000
Lakefront Iron Ore	2,711,000
Shipyard Activities	149,000
TOTAL BENEFITS	14,403,000

(1) December 1981 process.

Table 37 - Estimate of First Cost - Alternative 9A (1)

Construction Item	Total Cost	Traditional Cost Apportionment (2): Federal Share	Traditional Cost Apportionment (2): Non-Federal Share	Proposed Cost Apportionment (3): Federal Share	Proposed Cost Apportionment (3): Non-Federal Share
	$	$	$	$	$
1. Removal of 600 feet of East Breakwater	2,128,000	2,128,000	-	-	2,128,000
2. Construct 600 feet to Outer Breakwater	3,297,000	3,297,000	-	-	3,297,000
3. Dredging Outer Harbor	9,976,000	9,976,000	-	-	9,976,000
5. Dredging East BAsin	12,136,000	12,136,000	-	-	12,136,000
6. Excavation - Riverside Park	2,980,000	2,980,000	-	-	2.980,000
7. Sheetpile Cells - East Bank of Park Cut and Northern 213.5 feet of West Bank	1,744,000	-	1,744,000	-	1,744,000
8. Sheetpile Cells - Southern 225 feet of West Bank of Park Cut	1,972,000	-	1,972,000	-	1,972,000
9. Sheetpile Cells - River Diversion and Bridge	1,715,000	1,715,000	-	-	1,715,000
10. Bank Cut A with Sheetpile Protection	12,687,000	9,752,000	2,935,000	-	12,687,000
13. Transshipment Facility with Upriver Conveyor	32,665,000	-	32,665,000	-	32,665,000
16. Berm Construction - Diked Disposal Area	121,000	-	121,000	-	121,000
Subtotal	81,421,000	41,984,000	39,437,000	-	81,421,000
Engineering & Design	6,514,000	3,387,000	3,127,000	-	6,514,000
Supervision & Administration	7,182,000	3,735,000	3,447,000	-	7,182,000
Lands	2,405,0000	-	2,405,000	-	2,405,000
TOTAL FIRST COSTS	97,522,000	49,106,000	48,416,000	-	97,522,000

(1) December 1981 price levels.
(2) Costs for general navigation features (Items 1, 2, 3, 5, and 9) are 100 percent Federal.
(3) Total cost of construction is 100 percent non-Federal.

Table 38 - Estimated Investment Cost and Annual Charges - Alternative 9A (1)

Item	Total Project Cost	Traditional Cost Apportionment (4): Federal Share	Traditional Cost Apportionment (4): Non-Federal Share	Proposed Cost Apportionment (5): Federal Share	Proposed Cost Apportionment (5): Non-Federal Share
	$	$	$	$	$
Total First Costs, Excluding Lands	95,117,000	49,106,000	46,011,000	-	95,117,000
Interest During Construction	10,900,000	5,627,000	5,273,000	-	10,900,000
Lands	2,405,000	-	2,405,000	-	2,405,000
Total Investment, Including Lands	108,422,000	54,733,000	53,689,000	-	108,422,000
ANNUAL CHARGES FOR THE PROJECT					
Amortization (2)	8,482,000	4,282,000	4,200,000	-	8,482,000
Operation & Maintenance	1,302,000	975,000	327,000	-	327,000
Future Replacements (3)	487,000	-	487,000	-	487,000
TOTAL ANNUAL CHARGES	10,271,000	5,257,000	5,014,000	-	10,271,000

(1) December 1981 Price Levels.
(2) 7-5/8 percent Interest Rate, 50-year Project Life, Amortization Factor is 0.07823.
(3) Future replacements consist of average annual value of future investments in limited life cycle plan components.
(4) Costs for general navigation features are 100 percent Federal.
(5) Total cost of construction is 100 percent non-Federal.

Table 39 summarizes the average annual benefits, average annual charges, net average annual benefits and the benefit/cost ratio for Alternative 9A.

Table 39 - Summary Benefits and Costs - Alternative 9A (1)

	Average Annual Benefits	Average Annual Charges	Net Average Annual Benefits	Benefit/Cost Ratio
	$	$	$	
Total Project	14,403,000	10,271,000	4,132,000	1.4

(1) 1981 price levels and 7-5/8 percent interest rate.

Since the overall alternative is economically justified, it is necessary to consider the economic justification of the separable feature of the alternative, i.e., the Riverside Park cut.

Economic Justification of Separable Features of Alternative 9A - Implementation of a new channel through Riverside Park would allow direct access by the maximum size vessel to a point just upstream of the Erie Avenue Bridge. This would eliminate a segment of the overland conveyor (Construction Item 4) from the lakefront required for Alternative 9. However, large additional expenditures for new channel work and related construction items would be required for Alternative 9A which were not required by Alternative 9. A detailed cost estimate of the incremental costs associated with these separable features is presented in Table 40. As shown, the estimated incremental first cost of these items amounts to $27,355,000.

Table 41 presents the average annual charges including the appropriate amount of annual operations and maintenance costs for the separable features of Alternative 9A. These average annual charges amount to $3,045,000.

Comparing the benefit categories of Alternative 9A to 9 shows that Alternative 9A derives additional benefits for relief of Black River congestion ($680,000 annually) and for shipyard activities ($149,000 annually). Additional benefits of $859,000 annally are also obtained by reducing the costs associated with upriver iron ore shipments ($10,698,000-$9,839,000). These three benefit categories total to $1,688,000 and are the incremental benefits associated with the park cut feature of Alternative 9A.

Table 42 summarizes the incremental annual benefits, charges, net annual benefits, and the benefit/cost ratio associated with the development of the separable features of the Riverside Park Cut.

Table 40 - Estimate of Incremental Costs of Alternative 9A (1)

Construction Item	Total Cost
	$
5. Dredging East Basin	12,136,000
6. Excavation - Riverside Park	2,980,000
7. Sheet Pile Cells - East Bank of Park Cut and Northern 213.5 Feet of West Bank	1,744,000
8. Sheet Pile Cells - Southern 225 Feet of West Bank of Park Cut	1,972,000
9. Sheet Pile Cells - Riverside Diversion and Bridge	1,715,000
10. Bank Cut A with Sheet Pile Protection	12,687,000
SUBTOTAL	33,234,000
4. Coal Slip Modifications and Conveyor to Transshipment Facility (2)	(10,276,000)
SUBTOTAL	22,958,000
Engineering and Design	1,837,000
Supervision and Administration	2,025,000
Lands (3)	535,000
TOTAL FIRST COST	27,355,000

(1) December 1981 price levels.
(2) Alternative 9A eliminates the need for Construction Item 4; therefore, the cost of this item reduces the incremental cost of Alternative 9A.
(3) Consists of costs of lands for Item 6 minus costs of lands for Item 4 ($614,000 - $79,000 = $535,000).

Table 41 - Estimated Incremental Investment Cost and Annual Charges (1)

Item	Total Project Cost
	$
Total First Costs, Excluding Lands	26,820,000
Interest During Construction	3,068,000
Lands	535,000
Total Investment, Including Lands	30,423,000
Annual Charges	
Amortization (2)	2,380,000
Operation and Maintenance	665,000
TOTAL ANNUAL CHARGES	3,045,000

(1) December 1981 price levels.
(2) 7-5/8 percent interest rate, 50-year life, amortization factor is 0.07823

Table 42 - Incremental Justification - Separable Features of Alternative 9A (1)

	Total Annual Benefits	Total Annual Charges	Net Annual Benefits	Benefit/Cost Ratio
	$	$		
Incremental Value for Separable Features of Alternative 9A	+ 1,688,000	+ 3,045,000	-1,357,000	0.55

As shown in Table 42, the incremental net benefits associated with the separable features of Alternative 9A amount to a negative $1,357,000. With a resultant benefit/cost ratio of 0.55, the incremental features of Alternative 9A, the Riverside Park Cut, is not economically justified.

Environmental Features/Assessment of Plan 9A - Outer Harbor improvements for Plan 9A would be similar to those discussed in Plan 9, except that renovation of the coal slip dock would not be necessary. The difference is that Plan 9A includes a cut through Riverside Park and vessel dockage on the west bank, upstream of the Erie Avenue Bridge. Outer Harbor dredging, with the cut through Riverside Park, would result in 449,000 cy of saturated polluted material, 1,064,000 cy. of saturated nonpolluted material and 287,000 cy of rock, for a total of approximately 1,797,000 cy. Polluted material would be disposed of at the existing diked disposal site. Nonpolluted material would be disposed of at a designated open-lake site. That area of the harbor that has been previously dredged for commercial navigation would experience minimal impacts, including increased turbidity and sediment load.

According to correspondence with USFWS, 22 January 1981 (see Appendix F), the major impact of work in the Outer Harbor involves the deepening of previously undredged areas to enlarge the turning areas and to create the new channel leading to the Riverside Park Cut. All of this new dredging would occur in the 70 acres of presently undredged habitat on the east side of the Outer Harbor. The Riverside Park Cut would require the dredging of approximately 32 acres of previously undredged bottom habitat. The conversion of relatively shallow, undisturbed areas into deep, periodically dredged areas would decrease spawning potential of the areas, reduce the benthic production of the areas, and reduce the annual fish biomass production of the areas.

The cut through Riverside Park would be approximately 300 feet wide and 600 feet long at its centerline, and have vertical steel sheetpile walls. This cut would result in approximately 124,000 cy of saturated nonpolluted excavated material, approximately 93,000 cy of nonsaturated material and approximately 50,000 cy. of rock, for a total of approximately 267,000 cy. This realignment of the entrance to the Black River would permit vessel passage more nearly normal to the leaves of the existing Erie Avenue Bascule Bridge and would thereby eliminate the need for replacing this bridge. It would also allow 1,000-foot vessels to travel to and from the AmShip facility without tug assistance.

The Riverside Park Cut feature of this Alternative would have an impact on the development of a small-boat marina which is proposed in the east basin of the Outer Harbor. (See Volume 2 of the Lorain Harbor Study for details of this small-boat harbor.) The commercial navigation channel required in the east basin of the harbor (Construction Item 5) would reduce the water area available for development of this proposed small-boat harbor. Also, it would require the construction of a new inner harbor breakwater to protect the proposed small-boat marina from both wave action from the lake and the wakes of the large commercial vessels using the new channel.

A channel through this area would destroy a major part of Riverside Park. This park offers a small patch of green space with park benches, in an almost totally developed industrialized area. It would also require relocation of utilities. Access to the water treatment plant, the Coast Guard station, and the Lorain Yacht Club would be provided by driving two sets of sheet pile and filling the existing Black River channel between them. Blocking the existing channel in this manner is recommended so that the main flow would exit through the new cut, thereby reducing sedimentation in the channel. Gaps would be provided in the sheet pile cells across the existing channel to avoid creating a stagnant pool along the west side of the treatment plant.

The land to be excavated for the channel would become aquatic thereby providing bottom habitat, probably of low value due to poor water quality, deep depths, and vertical channel side slopes, equal to the amount of land excavated, approximately 5.40 acres. The soil in this area is designated as prime farmland by the U. S. Conservation Service. Because this land is presently used as a park and is situated in a commercial/industrial area, there is little chance that it would ever be used as farmland. Therefore, no impact in this regard is expected.

A cut on the west bank of the river, upstream of the Erie Avenue Bridge would be made to permit vessel dockage at the transshipment facility located here. Locating the transshipment facility here, in conjunction with the Riverside Park Cut, would help to alleviate vessel congestion at the entrance to the Inner Harbor, caused by vessels docking in the navigation channel to unload at Republic Steel's facility. This upstream cut would be bulkheaded, thus affording no new aquatic habitat. According to USFWS, many of the fish species persisting in the Inner Harbor are dependent on the remaining shallow water areas, a narrow band bordering the navigation channel, and the limited cover provided therein. If spawning is occurring in this section of the river, in spite of the water quality degradation, it is probably occurring in these shallow water areas. Approximately 1,500 feet of this habitat would be eliminated by this cut. Approximately 640,000 cy. of saturated, nonpolluted spoil material would be generated by this cut, as well as, approximately 790,000 cy of nonsaturated material, for a total of approximately 1,430,000 cy. The land taken to provide the cut (approximately 12.5 acres) is presently vacant and sparsely vegetated, thus terrestrial impacts should be minimal. The soil in this area has been designated as prime farmland by the U. S. Conservation Service. Because this land is situated in a commercial/industrial area, there is little chance that it would ever be used as farmland. Therefore, no impact in this regard is expected.

Impacts of the upstream conveyor system would be similar to those as discussed under Alternative 9.

There would be no displacement of farms if this alternative is implemented. However, approximately three homes would have to be relocated due to the cut through Riverside Park. Temporary noise and air pollution would be experienced during construction. However, since this is a highly industrialized area, the effects should be minimal. No significant increases in tax revenues or property values are expected. However, tax revenues would be lost from the land that would be taken to provide the docking facility upstream of the Erie Avenue Bridge on the west bank of the river. Tax revenues would also be lost from the area which would become the Riverside Park Cut. There would be a short-term increase in employment during construction. Businesses providing support facilities for the conveyor system would increase in number, thereby increasing employment. No significant impacts on regional or community growth are expected; however, the harbor improvements may facilitate plant expansion by U. S. Steel.

Since the Riverside Park Cut was found to be not economically justified, plans were not developed in the detail necessary to determine if major sanitary sewer relocation would be required for the trunk line to the Lorain Wastewater Treatment Plant. For the same reason, impacts of river diversion upon effluent mixing and discharge has not been evaluated.

Evaluation of Alternative 9A - In regard to the economic feasibility of this alternative, even though the overall plan exhibits economic feasibility with a benefit/cost ratio of 1.4, the Riverside Park Cut feature, which is a separable cost item, is not economically justified (B/C = 0.55). Therefore, this plan will not be considered further.

ALTERNATIVE 10 (LAKEFRONT TRANSSHIPMENT - SPECIAL PURPOSE VESSEL UPRIVER)

Description of Plan - Alternative 10 is essentially identical to Alternative 9 in all respects except one. Instead of the conveyor system from the transshipment facility upriver to U.S. Steel (Construction Item 13 for Alternative 9), this plan utilizes a transshipment facility and a special purpose vessel (Construction Item 14) for upriver ore movement. This special purpose vessel would be a highly maneuverable craft well suited for river navigation. This self-unloading vessel would have a cargo capacity of approximately 20,000 tons. The berthing facility for this vessel would be located in the west river bank across from American Shipbuilding. The construction features of this alternative are shown on Plate 25.

The other general features of this plan are breakwater modifications (Construction Items 1 and 2) to provide a wider entrance channel for 1,000-foot vessels and dredging the lake approach channel and the Outer Harbor area (Construciton Item 3). Modifications would be required to the existing lakefront coal slip in order to dock 1,000-foot vessels and a hopper and conveyor system would have to be constructed (Construction Item 4) to transport iron ore from the lakefront to the transshipment facility located upstream of the Erie Avenue Bridge. A sheetpile bulkhead (Construction Item 12) would be required at the transshipment facility to allow dockage of the special purpose vessel.

This plan would also require construction of a berm around the existing diked disposal area (Construciton Item 16) to provide an adequate area for disposal of polluted dredged material.

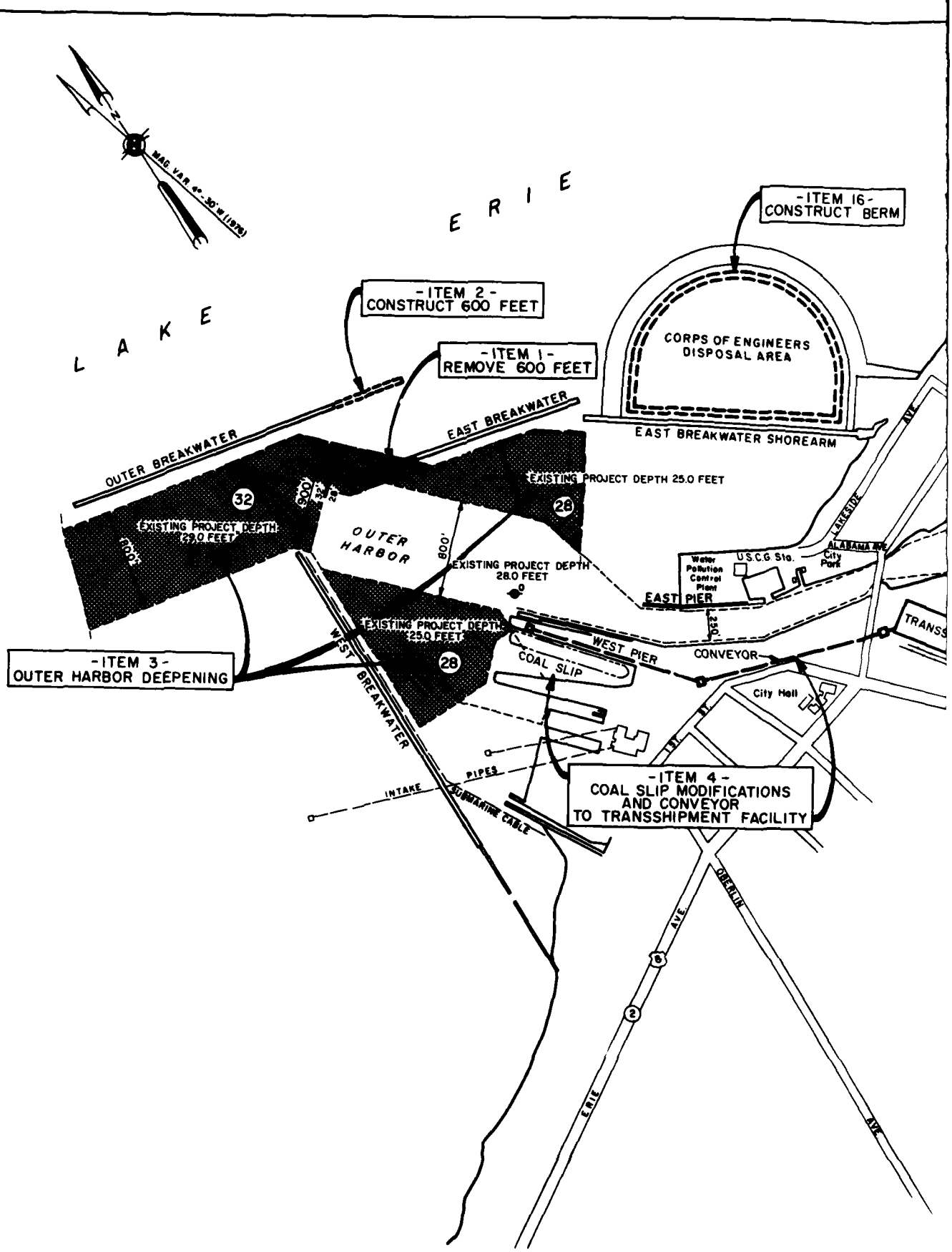
Cost Estimate for Alternative 10 - The summary of first costs for Alternative 10 is contained in Table 43. A detailed presentation of this cost is presented in Appendix C. As shown, the estimated total first cost for this alternative is $86,389,000. Utilizing the traditional cost-sharing method, the Federal share is $17,960,000 and the non-Federal share would be $68,429,000. For the President's proposed cost-sharing methodology, the entire $86,389,000 would be a non-Federal expense.

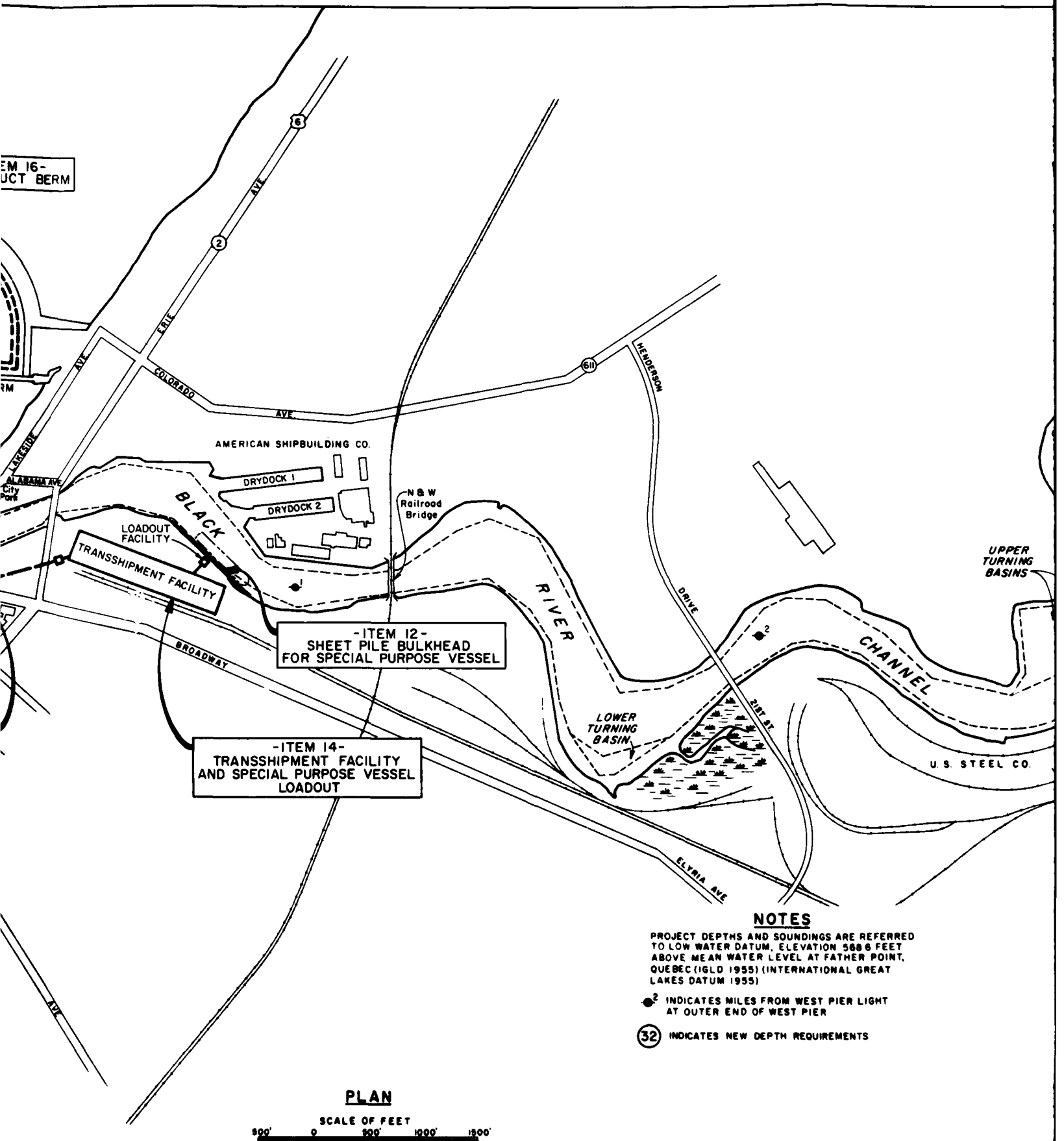
Table 44 shows the average annual charges for Alternative 10 for both the traditional and proposed cost-sharing methods. The total investment for this plan is $96,068,000, and including the operation and maintenance and future replacement costs the total annual charges are $8,792,000.

Economic Evaluation of Alternative 10 - The benefits derived from the implementation of this alterntative are discussed in detail in Appendix B. The benefit categories and the amount of benefits associated with the categories are summarized below and shown in Table B57 of Appendix B.

Category	Average Annual Benefit (1)
	$
Upriver Iron Ore	9,932,000
Upriver Limestone	165,000
Lakefront Iron Ore	2,711,000
TOTAL BENEFITS	12,808,000

(1) December 1981 price levels.


MAG. VAR. 6° 30' W (1976)
LAKE ERIE
-ITEM 16-
CONSTRUCT BERM
-ITEM 2-
CONSTRUCT 600 FEET
-ITEM 1-
REMOVE 600 FEET
CORPS OF ENGINEERS
DISPOSAL AREA
EAST BREAKWATER SHOREARM
OUTER BREAKWATER
EAST BREAKWATER
EXISTING PROJECT DEPTH 25.0 FEET
32
28
EXISTING PROJECT DEPTH
29.0 FEET
OUTER
HARBOR
800'
EXISTING PROJECT DEPTH
28.0 FEET
EXISTING PROJECT DEPTH
25.0 FEET
-ITEM 3-
OUTER HARBOR DEEPENING
WEST BREAKWATER
WEST PIER
CONVEYOR
COAL SLIP
EAST PIER
Water
Pollution
Control
Plant
U.S.C.G. Sta.
City
Park
ALABAMA AVE.
LAKESIDE AVE.
City Hall
PIPES
INTAKE
SUBMARINE CABLE
-ITEM 4-
COAL SLIP MODIFICATIONS
AND CONVEYOR
TO TRANSSHIPMENT FACILITY
OBERLIN AVE.
ERIE AVE.
6
2



NOTES

PROJECT DEPTHS AND SOUNDINGS ARE REFERRED TO LOW WATER DATUM, ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955) (INTERNATIONAL GREAT LAKES DATUM 1955)

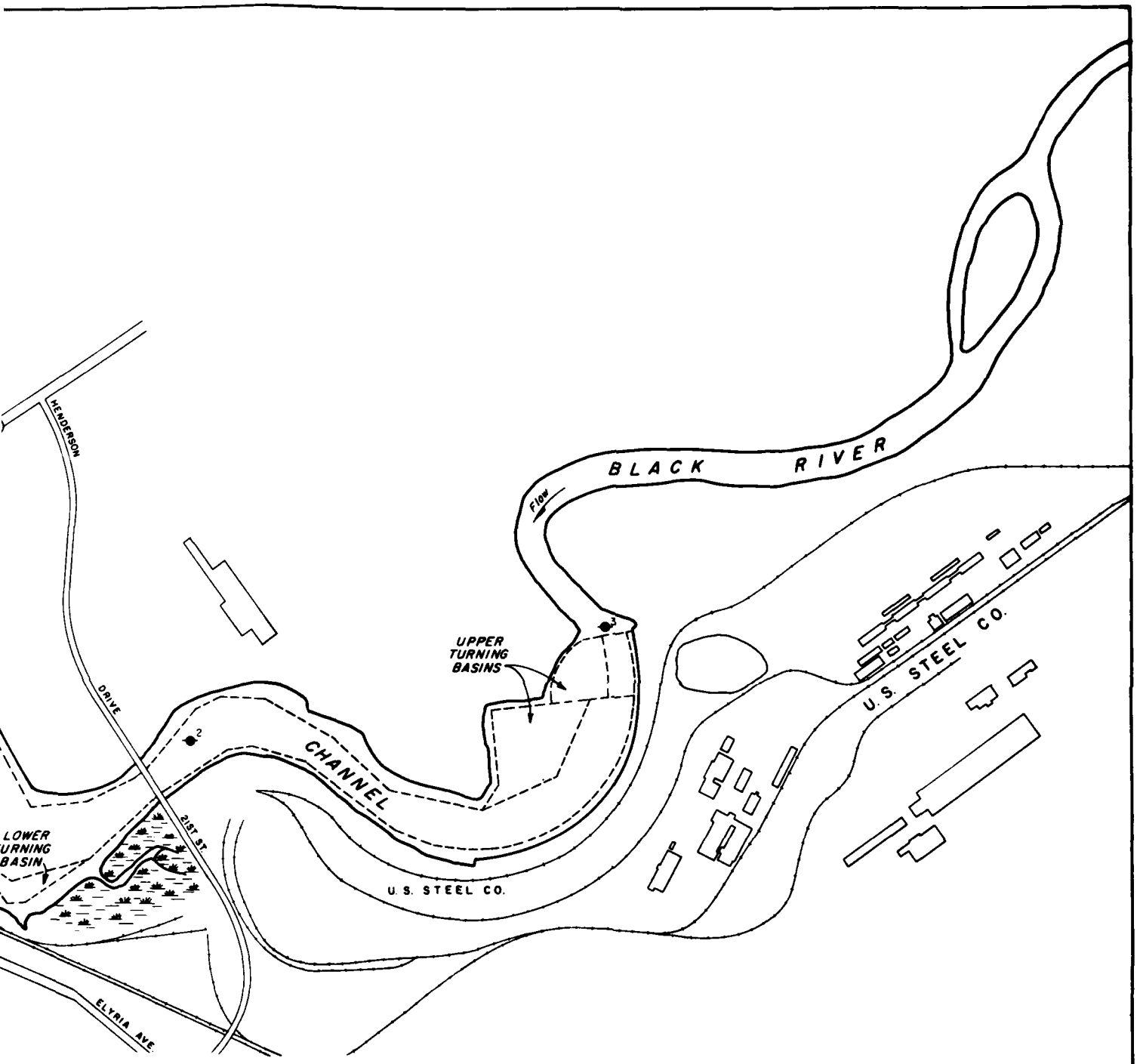
●² INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER

(32) INDICATES NEW DEPTH REQUIREMENTS

PLAN

SCALE OF FEET

500' 0 500' 1000' 1500'



NOTES

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●² INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER.

(32) INDICATES NEW DEPTH REQUIREMENTS

LORAIN HARBOR, OHIO
LORAIN HARBOR STUDY
ALTERNATIVE 10
LAKEFRONT TRANSSHIPMENT SPECIAL PURPOSE VESSEL UPRIVER
U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1983

3 PLATE 25

Table 43 - Estimate of First Cost - Alternative 10

Construction Item	Total (1) Project Cost	Traditional Cost Apportionment (2): Federal Share	Traditional Cost Apportionment (2): Non-Federal Share	Proposed Cost Apportionment (3): Federal Share	Proposed Cost Apportionment (3): Non-Federal Share
	$	$	$	$	$
1. Removal of 600 feet of East Breakwater	2,128,000	2,128,000	-	-	2,128,000
2. Construct 600 feet to Outer Breakwater	3,297,000	3,297,000	-	-	3,297,000
3. Dredging Outer Harbor	9,976,000	9,976,000	-	-	9,976,000
4. Coal Slip Modifications and Conveyor to Transshipment Facility	10,276,000	-	10,276,000	-	10,276,000
12. Sheetpile Bulkhead for Special Purpose Vessel	1,468,000	-	1,468,000	-	1,468,000
14. Transshipment Facility with Special Purpose Vessel Load-out	45,177,000	-	45,177,000		45,177,000
16. Berm Construction - Diked Disposal Area	121,000	-	121,000	-	121,000
Subtotal	72,443,000	15,401,000	57,042,000	0	72,443,000
Engineering & Design	5,795,000	1,217,000	4,578,000	0	5,795,000
Supervision & Administration	6,389,000	1,342,000	5,047,000	0	6,389,000
Lands	1,762,000	0	1,762,000	0	1,762,000
TOTAL FIRST COSTS	86,389,000	17,960,000	68,429,000	0	86,389,000

(1) December 1981 Price Levels.
(2) Costs for general navigation features (Items 1, 2, and 3) are 100 percent Federal.
(3) Total cost of construction is 100 percent non-Federal.

Table 44 - Estimated Investment Costs and Annual Charges - Alternative 10

Construction Item	Total (1) Project Cost	Traditional Cost Apportionment (4): Federal Share	Traditional Cost Apportionment (4): Non-Federal Share	Proposed Cost Apportionment (5): Federal Share	Proposed Cost Apportionment (5): Non-Federal Share
	$	$	$	$	$
Total First Costs, Excluding Lands	84,627,000	17,960,000	66,667,000	0	84,627,000
Interest During Construction	9,679,000	2,033,000	7,646,000	0	9,679,000
Lands	1,762,000	0	1,762,000	-	1,762,000
Total Investment, Including Lands	96,068,000	19,993,000	76,075,000	0	96,068,000
ANNUAL CHARGES FOR THE PROJECT					
Amortization (2)	7,515,000	1,564,000	5,951,000	0	7,515,000
Operation & Maintenance	895,000	340,000	550,000	0	895,000
Future Replacements (3)	382,000	0	382,000	0	382,000
TOTAL ANNUAL CHARGES	8,792,000	1,904,000	6,883,000	0	8,792,000

(1) December 1981 Price Levels.
(2) 7-5/8 percent interest rate, 50-year project life, amortization factor is 0.07823.
(3) Future replacements consist of the average annual value of future investments in limited life cycle components.
(4) Costs for general navigation features are 100 percent Federal.
(5) Total cost of construction is 100 percent non-Federal.

Table 45 below, summarizes the annual benefits, the average annual charges, the net average annual benefits and the benefit/cost ratio.

Table 45 - Summary of Benefits and Costs - Alternative 10

	Average Annual Benefits (1)	Average Annual Charges (1)	Net Average Annual Benefits	Benefit/Cost Ratio
	$	$	$	
Total Project	12,808,000	8,792,000	4,016,000	1.5

(1) December 1981 Price Levels and 7-5/8 percent interest rate.

Environmental Features/Assessment of Plan 10 - This alternative and its impacts would be identical to Alternative 9 in all ways but one. In lieu of the conveyor system, an upriver special purpose vessel facility would be constructed.

A berthing facility would be constructed for the special purpose vessel on the west bank of the Black River, just upstream from Erie Avenue. A conveyor would bring material from the Lakefront dock to the special purpose vessel. This would help to alleviate traffic congestion in the downtown area since the Erie Avenue Bridge would not have to be opened as often to let vessels pass to U. S. Steel. Vessel congestion at the river mouth would also be lessened since U. S. Steel's ships would no longer have to pass Republic's vessels docked at their pellet terminal. No significant excavation is required for dockage of the vessel. However, steel sheetpile bulkheading would be required. This would not provide suitable aquatic habitat. That portion of potential shallow water habitat now existing between the navigation channel and the shore, (approximately 700 feet long, 70 feet wide) would be lost to deep depths.

Placing the cargo stockpiles upstream from Erie Avenue and west of the special purpose berthing facility would require the removal of approximately 6,500 linear feet of railroad trackage.

Using a special purpose vessel to transport cargo to U.S. Steel would not significantly affect the natural environment since commercial craft already navigate the Federally-maintained river. This alternative would cause the least amount of disruption to current Inner Harbor users, since no major bank cuts would have to be made and minimal construction of land facilities would be necessary, unlike Alternative 9 that requires a conveyor to run along the west bank from the lakefront to U.S. Steel.

No significant increases in tax revenue or property values are expected. There would be a short-term increase in employment during construction. Business providing support service for the special purpose vessel, such as launches, fuel oil, and repairs, may experience an increase in employment. The employment may continue during the off-season since the special purpose vessels may be docked at American Shipbuilding facility, located on the Black

River, for rehabilitation and repairs. No significant impacts on regional or community growth are expected; however, harbor improvements may facilitate plant expansion by U. S. Steel. No people or farms would be displaced.

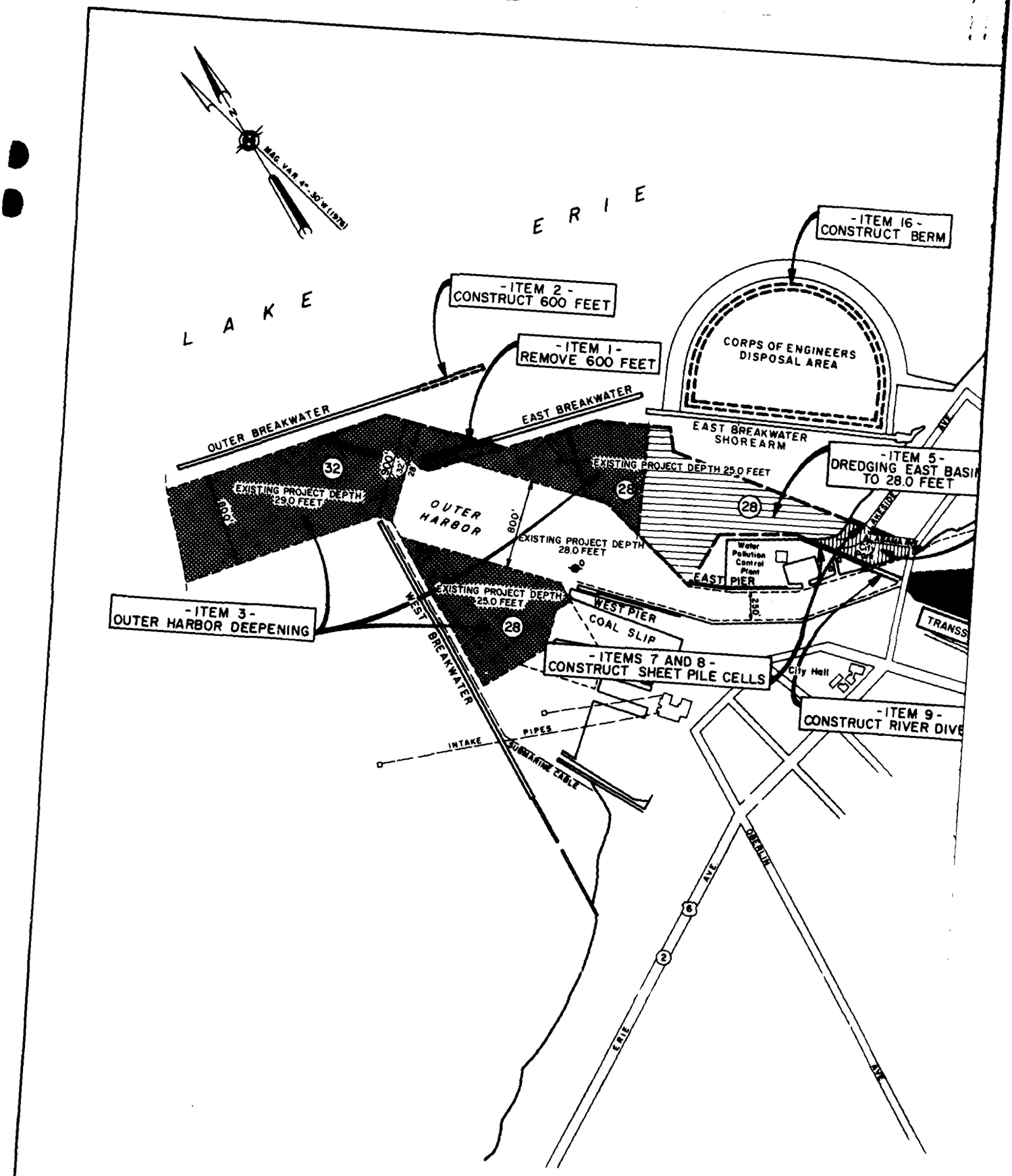
Evaluation of Alternative 10 - This plan exhibits economic feasibility with positive net benefits and a benefit/cost ratio of 1.5. Therefore, Alternative 10 warrants further consideration as the selected plan for commercial harbor improvements.

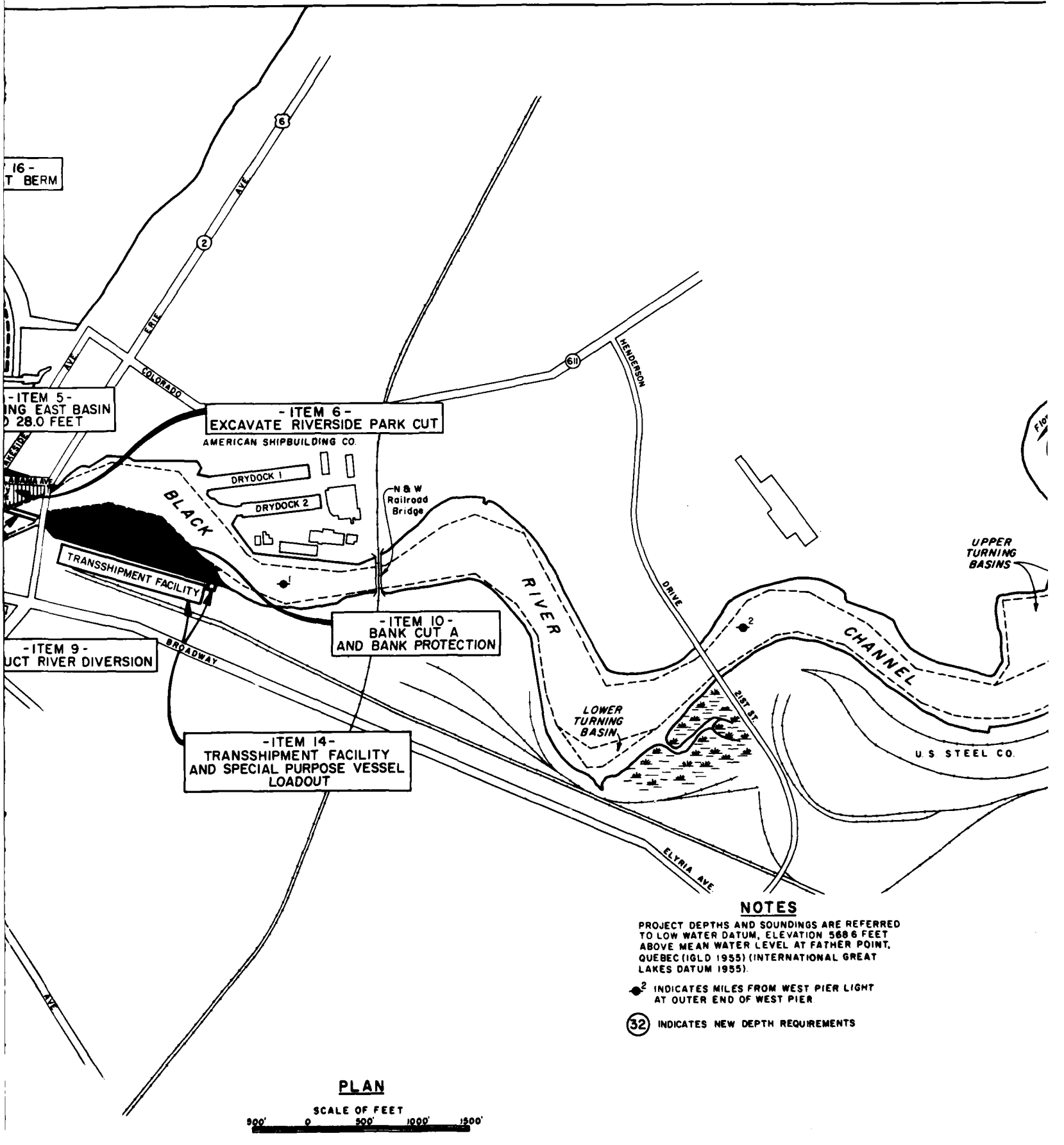
ALTERNATIVE 10A (RIVERSIDE PARK CUT WITH TRANSSHIPMENT UPRIVER BY SPECIAL PURPOSE VESSEL)

Description of Alternative 10A - This plan is similar to Alternative 9A except that upriver shipment of iron ore from the Erie Avenue transshipment facility would be by special purpose vessel instead of conveyor. Functionally, Alternative 10A is identical to Alternative 10 in that both plans would use a special purpose vessel to ship iron ore upstream to the U. S. Steel plant. The primary differences in these two plans are that Alternative 10A adds the "Riverside Park Cut" item and moves the off-loading facility from the lakefront coal slip to the area upstream from the Erie Avenue Bridge. Implementation of Alternative 10A would eliminate the need to modify the lakefront coal slip and the need to provide a conveyor system from this slip upriver to the transshipment facility. This alternative would provide the separable feature of allowing 1,000-foot vessels to more easily pass through the Erie Avenue Bridge by providing a new, straight channel through Riverside Park. The construction features of this plan are detailed on Plate 26.

Construction features which are contained in both Alternatives 10 and 10A are detailed below. The outer breakwater and east breakwater would be modified to provide a wider entrance channel for 1,000-foot vessels (Construction Items 1 and 2) and the Outer Harbor would require deepening (Construction Item 3). This alternative would also require construction of the transshipment facility and the special purpose vessel (Construction Item 14) for the upriver movement of iron ore. Both alternatives also required the construction of a berm in the existing diked disposal area (Construction Item 16) for containment of polluted material.

Construction features which are associated with the construction of the Riverside Park Cut are as follows. Deepening of the east basin, to a depth of 27.0 feet (Construction Item 5), would be required to provide a new approach channel to the Riverside Park Cut. The park cut itself would be about 600 feet long and provide a 300-foot wide channel (Construction Item 6) and would be bulkheaded with sheetpile cells (Construction Items 7 and 8). A sheetpile cell wall would be provided across the existing river channel, just downstream of the Erie Avenue Bridge, to allow access to the Coast Guard Station and the treatment plant (Construction Item 9). This wall would direct river flows through the new channel but would be constructed with gaps to allow for flushing of the old river mouth. At the site of the transshipment facility, on the west bank upstream of the Erie Avenue Bridge,


MAG. VAR. 4°-30' W (1978)
LAKE ERIE
-ITEM 16-
CONSTRUCT BERM
-ITEM 2-
CONSTRUCT 600 FEET
-ITEM 1-
REMOVE 600 FEET
CORPS OF ENGINEERS
DISPOSAL AREA
OUTER BREAKWATER
EAST BREAKWATER
EAST BREAKWATER
SHOREARM
EXISTING PROJECT DEPTH
29.0 FEET
32
600'
OUTER
HARBOR
800'
EXISTING PROJECT DEPTH 25.0 FEET
28
EXISTING PROJECT DEPTH
28.0 FEET
-ITEM 5-
DREDGING EAST BASIN
TO 28.0 FEET
Water
Pollution
Control
Plant
EAST PIER
EXISTING PROJECT DEPTH
25.0 FEET
-ITEM 3-
OUTER HARBOR DEEPENING
WEST
BREAKWATER
WEST PIER
COAL SLIP
-ITEMS 7 AND 8-
CONSTRUCT SHEET PILE CELLS
City Hall
-ITEM 9-
CONSTRUCT RIVER DIVE
INTAKE
PIPES
SUBMARINE CABLE
ERIE
AVE
OBERLIN
AVE
AVE



NOTES

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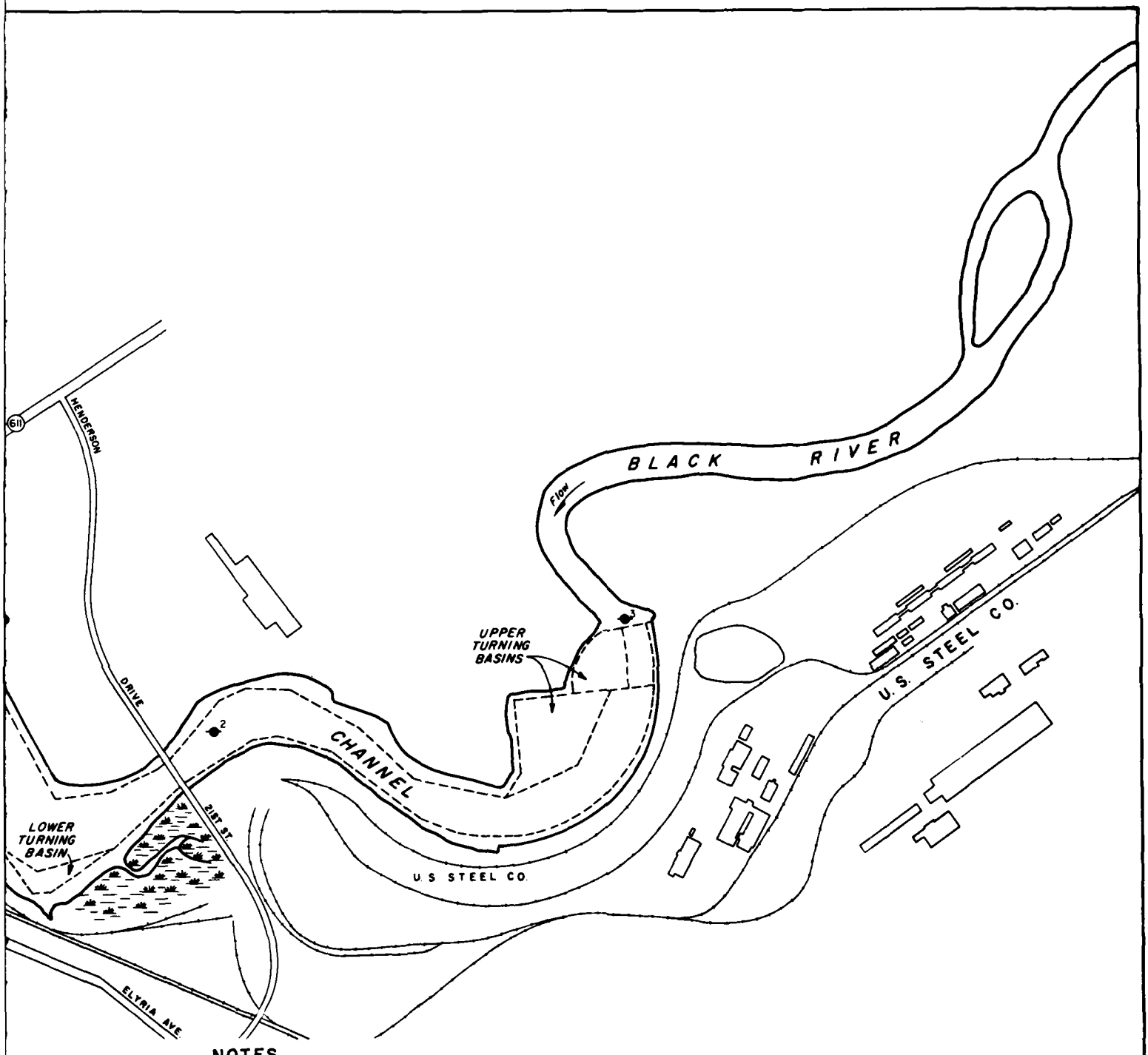
$\bullet^{2}$ INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER

(32) INDICATES NEW DEPTH REQUIREMENTS

PLAN

SCALE OF FEET

900' 0 500' 1000' 1500'



NOTES

PROJECT DEPTHS AND SOUNDINGS ARE REFERRED TO LOW WATER DATUM, ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955) (INTERNATIONAL GREAT LAKES DATUM 1955).

●² INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER.

(32) INDICATES NEW DEPTH REQUIREMENTS

LORAIN HARBOR, OHIO
LORAIN HARBOR STUDY
ALTERNATIVE 10A
RIVERSIDE PARK CUT SPECIAL PURPOSE VESSEL UPRIVER
U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1983

excavation and bulk heading would be required to permit 1,000-foot vessels to dock and not hinder other river traffic (Construction Item 10).

Cost Estimate for Alternate 10A - The summary estimate of first cost and cost allocation for Alternative 10A is contained in Table 46. A detailed presentation of the costs is shown in Appendix C. As shown, the estimated total first cost for Alternative 10A is $112,031,000. For the traditional cost allocation method, the Federal share would be $49,095,000 and the non-Federal share would be $62,936,000. Under the President's proposed cost-sharing, non-Federal interests would finance the entire cost of $112,031,000, as shown in Table 44.

The average annual charges for this plan are presented in Table 45 and displayed for both cost-sharing methodologies. The total investment cost for this plan is $124,581,000 (Table 47). Amortizing this cost over the 50-year project life at 7-5/8 percent interest and including operation and maintenance and future replacement cost, the average annual charges for this plan are $11,555,000.

Table 46 - Estimate of First Cost Alternative 10A

Construction Item	Total Project Cost (1)	Traditional Cost Apportionment (2)		President's Proposed Cost Apportionment (3)	
		Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	$	$	$	$	$
1. Removal of 600 feet of East Breakwater	2,128,000	2,128,000	0	0	2,128,000
2. Construct 600 feet to Outer Breakwater	3,297,000	3,297,000	0	0	3,297,000
3. Dredging Outer Harbor	9,976,000	9,976,000	0	0	9,976,000
5. Dredging East Basin	12,136,000	12,136,000	0	0	12,136,000
6. Excavation - Riverside Park Cut	2,980,000	2,980,000	0	0	2,980,000
7. Sheetpile Cells - East Bank of Park Cut and Northern 213.5 feet of West Bank	1,744,000	0	1,744,000	0	1,744,000
8. Sheetpile Cells - Southern 225 feet of West Bank of Park Cut	1,972,000	0	1,972,000	0	1,972,000
9. Sheetpile Cells - River Diversion and Bridge	1,715,000	1,715,000	0	0	1,715,000
10. Bank Cut A with Sheetpile Protection	12,687,000	9,752,000	2,935,000	0	12,687,000
14. Transshipment Facility with Special Purpose Vessel Loadout	45,177,000	0	45,177,000	0	45,177,000
16. Berm Construction - Diked Disposal Area	121,000	0	121,000	0	121,000
Subtotal	93,933,000	41,984,000	51,949,000	0	93,933,000
Engineering & Design	7,515,000	3,382,000	4,133,000	0	7,515,000
Supervision & Administration	8,286,000	3,729,000	4,557,000	0	8,286,000
Lands	2,297,000	0	2,297,000	0	2,297,000
TOTAL FIRST COSTS	112,031,000	49,095,000	62,936,000	0	112,031,000

(1) December 1981 Price Levels.
(2) Costs for general navigation features (Items 1, 2, 3, 5, and 9) are 100 percent Federal.
(3) Total cost of construction is 100 percent non-Federal.

Table 47 - Estimated Investment Cost and Annual Charges - Alternative 10A

Item	Total Project Cost (1)	Traditional Cost Apportionment (4): Federal Share	Traditional Cost Apportionment (4): Non-Federal Share	President's Proposed Cost Allocation (5): Federal Share	President's Proposed Cost Allocation (5): Non-Federal Share
	$	$	$	$	$
Total First Costs, Excluding Lands	109,734,000	49,095,000	60,637,000	0	109,734,000
Interest During Construction	12,550,000	5,648,000	6,902,000	0	12,550,000
Lands	2,297,000	0	2,297,000	0	2,297,000
Total Investment, Including Lands	124,581,000	54,743,000	69,838,000	0	124,581,000
ANNUAL CHARGES FOR THE PROJECT					
Amortization (2)	9,746,000	4,283,000	5,463,000	0	9,746,000
Operation & Maintenance	1,427,000	975,000	452,000	0	1,427,000
Future Replacements (3)	382,000	0	382,000	0	382,000
TOTAL ANNUAL CHARGES	11,555,000	5,258,000	6,297,000	0	11,555,000

(1) December 1981 Price Levels.
(2) 7-5/8 percent Interest Rate, 50-year Project Life, Amortization Factor is 0.07823.
(3) Future replacements consist of average annual value of future investments in limited life cycle plan components.
(4) Costs for general navigation features are 100 percent Federal.
(5) Total Cost of construction is 100 percent non-Federal.

Economic Evaluation of Alternative 10A - Alternatives 10 and 10A are the same plan except that Alternative 10A contains the separable feature of the Riverside Park Cut. The primary purposes of the Riverside Park Cut is to avoid congestion at the mouth of the existing river and to provide better access of 1,000-foot vessels to the AmShip facility. Therefore, the incremental costs and benefits specifically associated with the Park Cut must be separated from the other project costs and benefits for this evaluation. The costs associated with the park cut are required to be offset by sufficient benefits, produced by this feature, to economically justify its construction.

Therefore, the economic evaluation of this alternative will consist of two parts. The first part will evaluate the economic justification of the entire project. The second component of the evaluation will consider the economic feasibility of the separable feature of the Riverside Park Cut.

For the evaluation of the total project, the total investment cost for Alternative 10A, as shown in Table 47 is $124,581,000. Amortizing this cost over the 50-year project life and including operation and maintenance and future replacement costs the total annual charges for this are $11,555,000 (Table 47).

The average annual benefits associated with Alternative 10A are detailed in Appendix B and shown below:

Category	Average Annual Benefits (1)
	$
Upriver Iron Ore	10,791,000
Upriver Limestone	165,000
Lakefront Iron Ore	2,711,000
Black River Congestion	680,000
Shipyard Activities	149,000
TOTAL BENEFITS	14,496,000

(1) December 1981 prices.

Table 48, below, summarizes the average annual benefits, average annual charges, net average annual benefits and the benefit/cost ratio for Alternative 10A.

Table 48 - Summary of Benefits and Costs - Alternative 10A (1)

	Average Annual Benefits	Average Annual Charges	Net Average Annual Benefits	Benefit/Cost Ratio
	$	$	$	
Total Project	14,496,000	11,555,000	2,941,000	1.3

(1) December 1981 price levels and 7-5/8 percent interest rate.

As shown on Table 43, the overall Alternative 10A exhibits economic feasibility with a benefit/cost ratio of 1.3. Consideration must be given to the economic feasibility of the incremental feature of this plan; i.e., the Riverside Park Cut.

Economic Justification of Separable Features of Alternative 10A - Construction of a new channel through Riverside Park would allow direct access by maximum sized vessels to the transshipment facility located just upstream of the Erie Avenue Bridge. Construction of this new channel would eliminate the segment of the overland conveyor (Construction Item 4) from the lakefront and the sheetpile bulkhead for the special purpose vessel (Construction Item 12) required for Alternative 10. However, large additional expenditures would be required for construction of this new channel and related construction items for Alternative 10A which was not required for Alternative 10. A detailed estimate of the incremental costs of these separable features is presented in Table 49. As shown, the estimated total first cost of incremental costs between Alternatives 10A and 10 amounts to $25,640,000.

Table 50 shows the average annual charges including annual operation and maintenance costs for the incremental costs associated with Alternative 10A. These incremental average annual charges amount to $2,660,000.

Comparing the benefit categories of Alternative 10 and 10A to show that Alternative 10A derives new additional benefits for relief of Black River congestion ($680,000 annually) and for shipyard activities ($149,000 annually). Additional benefits of $859,000 annually are also obtained by reducing the costs associated with upriver iron ore shipments ($10,791,000 - $9,932,000 = $859,000). These three benefit categories total to $1,688,000 and are the incremental benefit associated with the park cut feature of Alternative 10A.

Table 51 summarizes the incremental benefits, charges, net annual benefits, and the benefit/cost ratio associated with the development of the separable features of the Riverside Park Cut,

Table 49 - Estimate of Incremental Costs of Alternative 10A (1)

Construction Item	Total Cost
	$
5. Dredging East Basin	12,136,000
6. Escavation - Riverside Park Cut	2,980,000
7. Sheet Pile Cells - East Bank of Park Cut and Northern 213.5 feet of West Bank	1,744,000
8. Sheet Pile Cells - Southern 225 Feet of West Bank of Park Cut	1,972,000
9. Sheet Pile Cells - River Diversion and Bridge	1,715,000
10. Bank Cut A with Sheet Pile Protection	12,687,000
SUBTOTAL	33,234,000
4. Coal Slip Modification and Conveyor to Transshipment Facility (2)	(10,276,000)
12. Sheet Pile Bulkhead for Special Purpose Vessel (2)	(1,468,000)
SUBTOTAL	21,490,000
Engineering and Design	1,719,000
Supervision and Administration	1,896,000
Lands	535,000
TOTAL INCREMENTAL FIRST COST	25,640,000

(1) December 1981 price levels.
(2) Alternative 10A eliminates the need fro Construction Items 4 and 12 of Alternative 10; therefore, the cost of these items reduces the incremental cost of Alternative 10A.
(3) Consists of costs of lands for Item 6 minus cost of lands for Item 4 ($614,000 - $79,000 = $535,000).

Table 50 - Estimated Incremental Investment Cost and Annual Charges for Alternative 10A (1)

Item	Total Project Cost
	$
Total First Costs, Excluding Lands	25,105,000
Interest During Construction	2,871,000
Lands	535,000
Annual Charges	
Amortization (2)	2,230,000
Operation and Maintenance	430,000
TOTAL INCREMENTAL ANNUAL CHARGES	2,660,000

(1) December 1981 price levels.
(2) 7-5/8 percent interest, 50-year life, amortization factor is 0.07823.

Table 51 - Incremental Justification - Separable Features of Alternative 10A (1)

	Total Annual Benefits	Total Annual Charges	Net Annual Benefits	Benefit/Cost Ratio
	$	$	$	
Incremental Value for Separable Features of Alternative 10A	+1,688,000	+2,660,000	- 972,000	0.63

(1) December 1981 price levels.

As shown in Table 51, the incremental net benefits for the incremental features of Alternative 10A amount to a negative $972,000. With a benefit/cost ratio of 0.63, the incremental features of Alternative 10A, the Riverside Park Cut, is not economically justified.

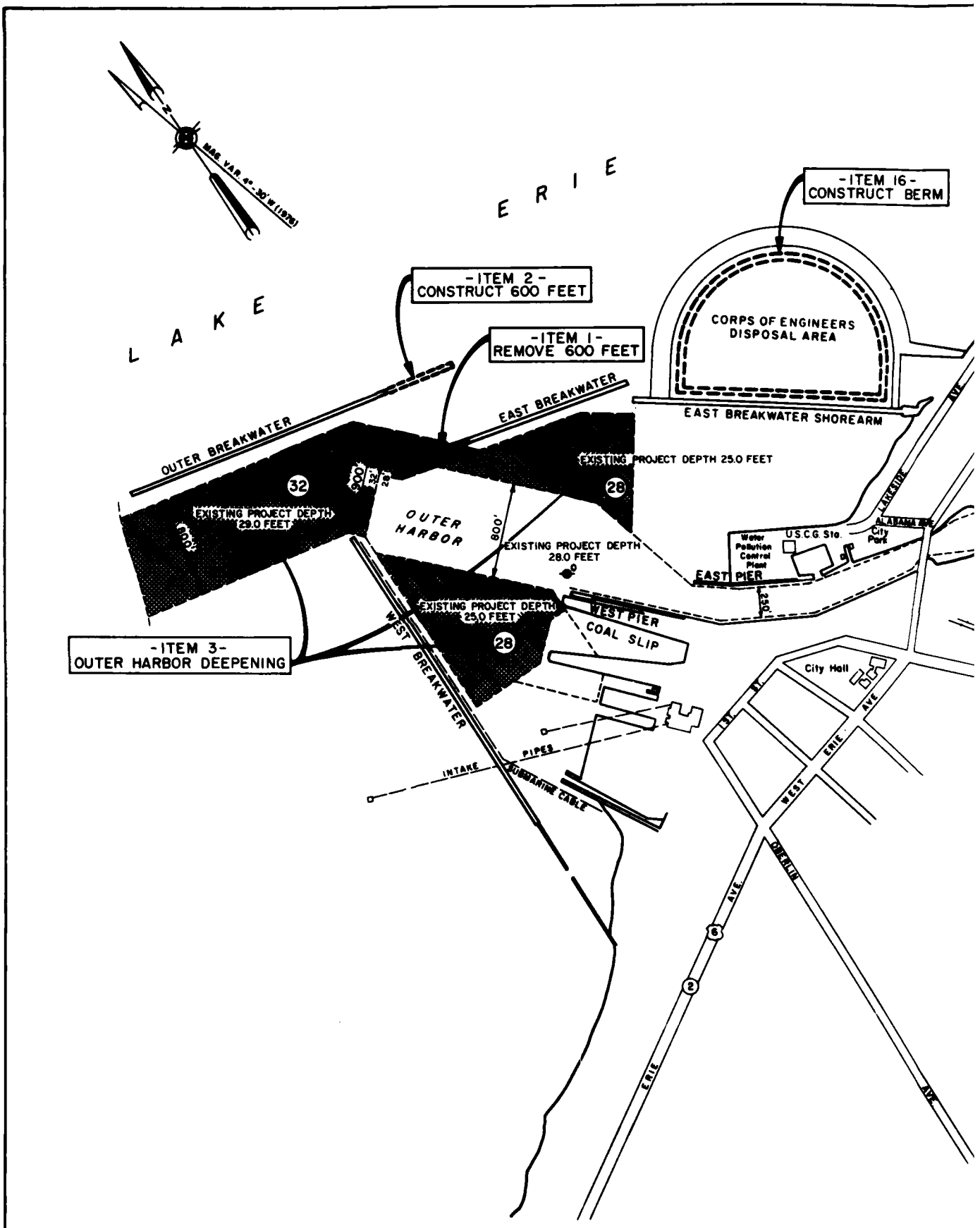
Environmental Features/Assessment of Alternative 10A - Alternative 10A is essentially the same as 9A, except that in lieu of the conveyor, a special purpose vessel would be used to transport material upstream to U.S. Steel as described in Alternative 10.

Evaluation of Alternative 10A - In conclusion, even though the overall plan is economically feasible with a benefit/cost ratio of 1.3 the separable feature of this alternative (the park cut) does not exhibit economic feasibility with a B/C ratio of only 0.63, and therefore, implementation of this alternative is not warranted.

ALTERNATIVE 18 (DIRECT DELIVERY TO U. S. STEEL IN 767-FOOT VESSELS - UPRIVER BEND WIDENING)

Description of Alternative 18 - The concepts leading to the development of this plan are different than those used to develop Alternatives 9, 9A, 10, and 10A. This alternative utilizes the concept of direct delivery of iron ore upriver to U. S. Steel in 767-foot vessels versus the construction of a lakefront transshipment facility for 1,000-foot vessles. As noted previously, U. S. Steel informed the District during this detailed study phase that it's most probable future maximum sized vessel at Lorain will be the 767-foot vessel. On this basis, alternative plans (Alternatives 18 and 18A) that would accommodate this expected "most probable future" were devised during the detailed sutdy phase.

The construction items associated with Alternative 18 are described below and shown on Plate 27. This plan would require modifications to the Outer Breakwater and East Breakwater (Construction Items 1 and 2) to provide a wider entrance channel for 1,000-foot vessels that service Republic Steel's lakefront transshipment facility and Am Ship Co. Also included in the Outer Harbor improvements is the need to deepen the harbor entrance and the Outer Harbor (Construction Item 3). The disposal of polluted dredged material from these areas would require construction of a berm in the existing diked disposal area (Construction Item 16) to accommodate the additional material.


MAG VAR 4°-30' W (1976)
LAKE ERIE
-ITEM 16-
CONSTRUCT BERM
-ITEM 2-
CONSTRUCT 600 FEET
-ITEM 1-
REMOVE 600 FEET
CORPS OF ENGINEERS
DISPOSAL AREA
EAST BREAKWATER SHOREARM
OUTER BREAKWATER
EAST BREAKWATER
EXISTING PROJECT DEPTH 25.0 FEET
32
28
600'
24'
20'
EXISTING PROJECT DEPTH
29.0 FEET
1000'
OUTER
HARBOR
800'
EXISTING PROJECT DEPTH
28.0 FEET
EAST PIER
Water
Pollution
Control
Plant
U.S.C.G. Sta.
City
Park
LAKESIDE
ALABAMA AVE
EXISTING PROJECT DEPTH
25.0 FEET
WEST PIER
COAL SLIP
-ITEM 3-
OUTER HARBOR DEEPENING
WEST BREAKWATER
PIPES
INTAKE
SUBMARINE CABLE
City Hall
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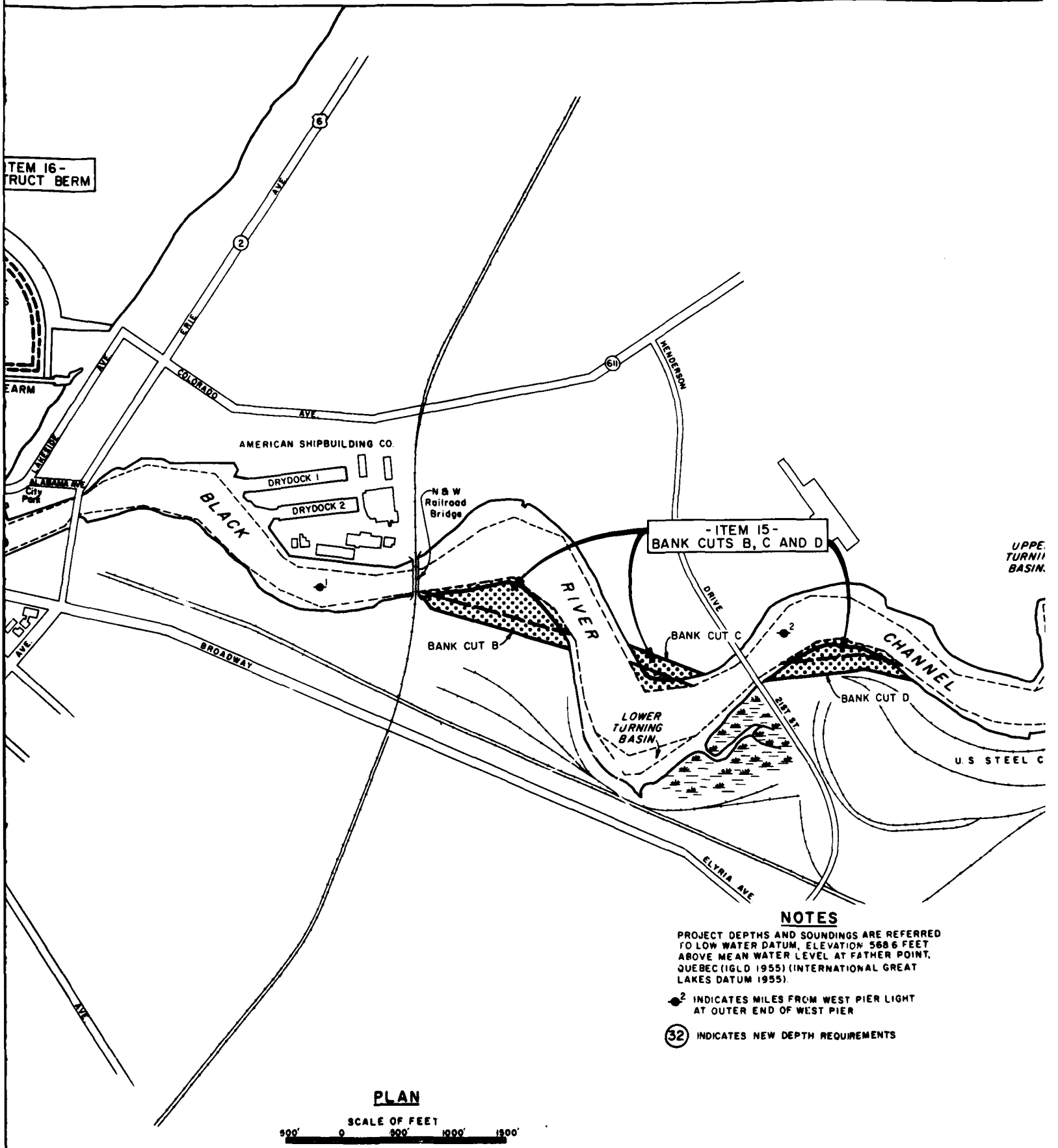


NOTES

PROJECT DEPTHS AND SOUNDINGS ARE REFERRED TO LOW WATER DATUM, ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955) (INTERNATIONAL GREAT LAKES DATUM 1955).

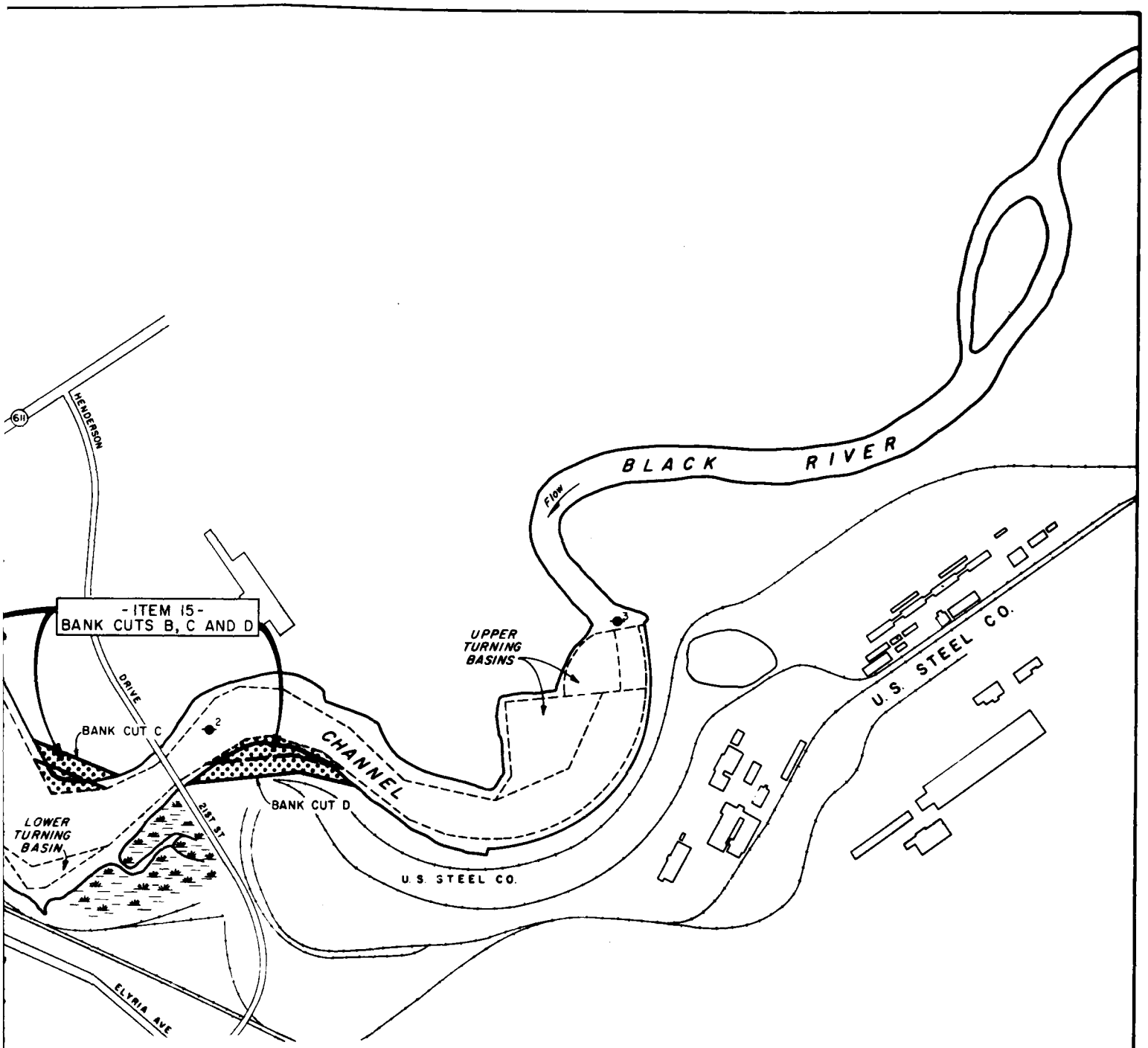
●² INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER

(32) INDICATES NEW DEPTH REQUIREMENTS

PLAN

SCALE OF FEET

900' 0 900' 1900' 1500'



NOTES

PROJECT DEPTHS AND SOUNDINGS ARE REFERRED TO LOW WATER DATUM, ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955) (INTERNATIONAL GREAT LAKES DATUM 1955)

●^{2} INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER

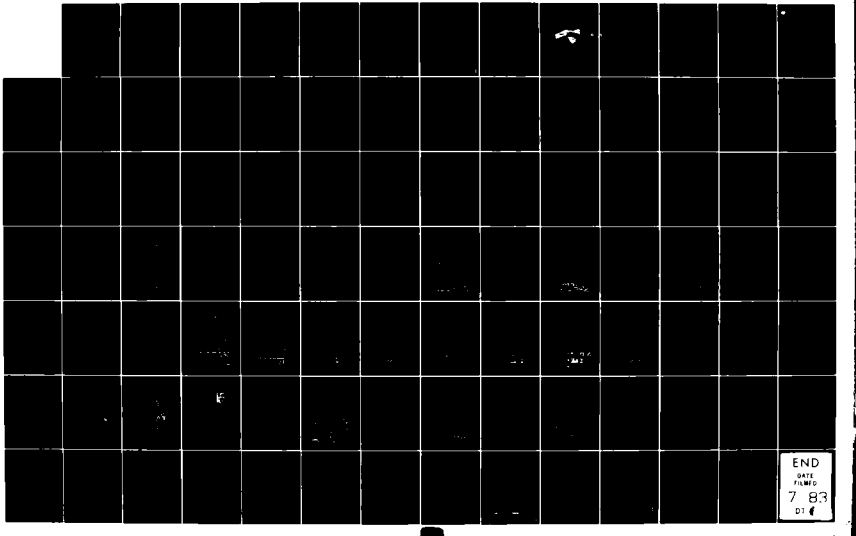
(32) INDICATES NEW DEPTH REQUIREMENTS

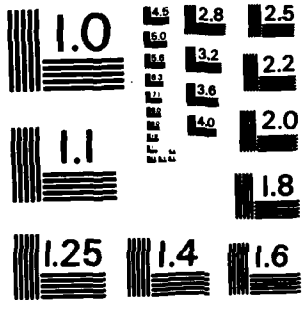
LORAIN HARBOR, OHIO
LORAIN HARBOR STUDY
ALTERNATIVE 18

DIRECT DELIVERY 767 FOOT VESSELS

U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1983

AD-A129 330 LORAIN HARBOR OHIO COMMERCIAL NAVIGATION STUDY VOLUME I 3/3
MAIN REPORT AND DRAFT ENVIRONMENTAL IMPACT STATEMENT
(U) CORPS OF ENGINEERS BUFFALO NY BUFFALO DISTRICT
UNCLASSIFIED MAY 83 F/G 13/2 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Table 52 - Estimate of First Cost for Alternative 18

Construction Item	Total Project Cost (1)	Traditional Cost Apportionment (3): Federal Share	Traditional Cost Apportionment (3): Non-Federal Share	President's Proposed Cost Apportionment: Federal Share	President's Proposed Cost Apportionment: Non-Federal Share
	$	$	$	$	$
1. Remove 600 feet of East Breakwater	2,128,000	2,128,000	-	-	2,128,000
2. Construct 600 feet to Outer Breakwater	3,297,000	3,297,000	-	-	3,297,000
3. Dredge Outer Harbor	9,976,000	9,976,000	-	-	9,976,000
15. Excavate Cuts B, C, D (2)	5,924,000	2,962,000	2,962,000	-	5,924,000
16. Berm Construction - Diked Disposal Area	121,000	-	121,000	-	121,000
Subtotal	21,446,000	18,363,000	3,083,000	-	21,446,000
Engineering & Design	1,716,000	1,476,000	240,000	-	1,716,000
Supervision & Administration	1,891,000	1,626,000	265,000	-	1,891,000
Lands	523,000	-	523,000	-	523,000
TOTAL FIRST COSTS	25,576,000	21,465,000	4,111,000	-	25,576,000

(1) December 1981 Price Levels.
(2) 50-50 Cost-sharing for this item.
(3) Costs for general navigation features (Construction Items 1, 2, and 3) are 100 percent Federal.
(4) Total cost of construction is 100 percent non-Federal.

Table 53 - Estimated Investment Cost and Annual Charges - Alternative 18

Item	Total Project Cost (1)	Traditional Cost Apportionment (3): Federal Share	Non-Federal Share	President's Proposed Cost Allocation (4): Federal Share	Non-Federal Share
	$	$	$	$	$
Total First Costs, Excluding Lands	25,053,000	21,465,000	3,588,000	-	25,053,000
Interest During Construction	1,910,000	1,643,000	267,000	-	1,910,000
Lands	523,000	-	523,000	-	523,000
Total Investment, Including Lands	27,486,000	23,108,000	4,378,000	-	27,486,000
ANNUAL CHARGES FOR THE PROJECT					
Amortization (2)	2,150,000	1,808,000	342,000	-	2,150,000
Operation & Maintenance	429,000	369,000	60,000	-	429,000
TOTAL ANNUAL CHARGES	2,579,000	1,177,000	402,000	-	2,579,000

(1) December 1981 price levels.
(2) 7-5/8 percent Interest Rate, 50-year Project Life, Amortization Factor is 0.07823.
(3) Cost for general navigation features are 100 percent Federal.
(4) Total cost of construction is 100 percent non-Federal.

As suggested by U. S. Steel and subsequently confirmed by the District, three upriver bend cuts (designated Cuts B, C, and D) would be required in order to allow the 767-foot vessels involved in upriver trade to draft 1-foot deeper, thereby eliminating these areas as depth constraints at Lorain Harbor. Cut B is on the west bank immediately upstream of the N&W Railroad Bridge and would provide approximately 150 feet of additional width at its widest point. Cut C is on the east bank just downstream of the 21st Street Bridge and provides up to almost 200 feet of additional channel width. Cut D, located on the west bank just upstream of the 21st Street Bridge would widen the channel by up to approximately 150 feet.

Cost Estimate for Alternative 18 - Table 52 below, summarizes the estimated first cost of Alternative 18. A detailed assessment of the cost estimate is contained in Appendix C. As shown, the estimated first cost for this alternative is $25,576,000. Under the traditional cost apportionment method, the Federal share amounts to $21,465,000 and the non-Federal share would be $4,111,000. For the President's proposed cost-sharing, non-Federal interests would finance the entire $25,576,000 construction cost.

An explanation regarding the 50 percent Federal, 50 percent non-Federal cost apportionment of Construction Item 15, (excavation of Bank Cuts B, C, and D) for the Traditional Method of apportionment was presented at the beginning of this section under the heading "Cost Apportionment for Alternatives 18 and 18A."

In summary it states that according to ER 1105-2-20, a Federal interest does exist in a situation where there initially exists only one beneficiary of a modification to an existing channel, but a reasonable prospect exists for later multiple use by other users. Cost-sharing for this situation requires that local interests contribute annually, until such time as multiple use of the general navigation feature actually occurs, 50 percent of the annual charges for interest and amortization of the Federal first cost of the improvement. For this analysis, it was assumed that "multiple use" would not initially exist, however, a reasonable prospect for "multiple use" in the future does exist. Since the District cannot predict when this "multiple use" will take place, Tables 52 and 53 assume that multiple use has not yet occurred and, therefore, display 50 percent Federal, 50 percent non-Federal cost sharing for Construction Item 15 "Excavate Bank Cuts B, C, and D."

The average annual costs associated with Alternative 18 are presented in Table 53 for both the traditional and proposed cost apportionment methodologies. The total investment for this plan is $27,486,000. Amortizing the cost and including operation and maintenance costs, the total annual charges for this plan are $2,579,000.

Economic Evaluation of Alternative 18 - The economic evaluation of Alternative 18 consists of two parts. The first part concerns evaluating the entire project. The second involves the evaluation of the separable construction features, those being the Outer Harbor work and the upriver bend cuts.

Regarding the economic evaluation of the total alternative, a detailed discussion of the total project benefits that would be realized from implementation of this plan is presented in Appendix B. Benefit categories and associated benefit amounts are summarized below.

Benefit Category	Average Annual Benefits (1)
	$
Upriver Iron Ore	2,625,000
Upriver Limestone	165,000
Lakefront Iron Ore	2,711,000
TOTAL BENEFITS FOR ALTERNATIVE 18	5,501,000

(1) December 1981 price levels.

Table 54, below, summarizes the total project average annual charges taken from Table 53, total average annual benefits, the net average annual benefits, and the benefit/cost ratio for Alternative 18.

Table 54 - Summary of Benefits and Costs - Alternative 18

	Average Annual Benefits (1)	Average Annual Charges (1)	Net Average Annual Benefits	Benefit/Cost Ratio
Total Project	5,501,000	2,579,000	2,922,000	2.1

(1) December 1981 price levels and 7-5/8 percent interest rate.

As Table 54 indicated, the overall plan for Alternative 18 shows economic justification with a benefit/cost ratio of 2.1. Consideration must next be given to the economic feasibility of the incremental features of this alternative; i.e., the Outer Harbor work and the upper bend cuts.

Addressing the evaluation of the separable construction features, the costs associated with the Outer Harbor work consist of Construction Items 1, 2, 3, and 16 (see Table 52). Including the proportionate amount of Engineering and Design (E&D) and Supervision and Administration (S&A) costs, the total first cost of the Outer Harbor work amounts to $18,120,000. Including interest during construction and amortizing this value over the 50-year project life, and including Operation and Maintenance (O&M) costs, the total annual charges for the Outer Harbor work amounts to $1,834,000.

Considering the costs associated with the upriver bend widening we have to only consider Construction Item 15. Adding the appropriate E&D and S&A charges the total first cost for the upriver improvements would be $7,456,000. Adding interest during construction and amortizing over the 50-year project life and including the annual O&M costs the total annual charges for the upriver bend widening are $745,000.

The average annual benefit attributed to the separate construction feature of the Outer Harbor is presented in Appendix B as "Direct Delivery to Upriver Stock Piles and Outer Harbor Improvements Only" and summarized here. Improvements to the Outer Harbor only will result in benefits to upriver and lakefront iron ore movements, as well as upriver limestone movements. Upriver iron ore benefits amount to $1,607,000, lakefront iron ore benefits are $2,711,000, and upriver limestone benefits are $165,000. Therefore, the total benefits attributed to the Outer Harbor improvements are the sum of these three benefit categories, and amounts to $4,483,000.

The benefits associated with the bend widening are the difference between the total benefits associated with "Direct Delivery to Upriver Stockpiles, Outer Harbor Improvements and Black River Modifications" and "Direct Delivery to Upriver Stockpiles and Outer Harbor Improvements Only" (see Table B57 Appendix B). The difference between these options amounts to $1,081,000 and is the average annual benefit attributed to the upriver bend widening.

Table 55 presents the incremental justification of each of the separate features of Alternative 18 and benefit/cost ratio for each of the features.

Table 55 - Incremental Justification - Alternative 18

Separable Feature	Total Annual Benefits for Separable Feature (1)	Total Annual Cost	Benefit/Cost Ratio
	$	$	
Outer Harbor Features	4,483,000	1,834,000	2.4
Upriver Bend Widening	1,018,000	745,000	1.4

(1) December 1981 price level and 7-5/8 percent interest rate.

As shown above in Table 55, both of the separable features of Alternative 18 are justified (B/C >1.0).

Environmental Features/Assessment of Alternative 18 - This alternative would improve harbor entrance conditions to permit safe and efficient operation of 1,000-foot vessels to the lakefront and provide channel improvements on the Black River to permit passage of 767-foot vessels to the Upper Turning Basin. In addition, this alternative does not preclude the future construction of transshipment options should, sometime in the future, the fleet involved in upriver trade change to the use of 1,000-foot vessels.

Outer Harbor improvements would be the same as those discussed under Alternatives 9 and 10, with the exception of the modifications to the coal slip, which would not be necessary under Alternative 18.

Bank Cut B, on the west bank of the river, upstream of the N&W Railroad Bridge would result in approximately 270,000 cy of spoil material which would

be open-lake disposed. The major portion of the bank would have a IV:4H sideslope. Approximately 4.3 acres of wooded habitat would be lost. According to USFWS, this wooded area presently supports a number of small mammals and songbirds that would be forced to move to nearby habitat. Approximately 1,000 feet of shallow-water bank habitat would be disturbed. The soil in this area is designated as prime farmland by the U. S. Conservation Service. Because this land is situated in a commercial/ industrial area, there is little chance it would be used as farmland. Therefore, no impact in this regard is expected.

Bank Cut C, on the east bank, downstream of the 21st Street Bridge, would result in approximately 184,000 cy of spoil material, which would be open-lake disposed. The major portion of the bank would have a IV:4H sideslope. Approximately 2.5 acres of land would be lost. According to USFWS, this area is of very limited wildlife value because of prior commercial development. This land is presently vacant, thus impacts should be minimal. Approximately 700 feet of shallow-water bank habitat would be disturbed. The soil in this area is designated as prime farmland by the U. S. Conservation Service. Because this land is located in an industrial/commercial area, there is little chance it would ever be farmed. Therefore, no impact in this regard is expected.

Bank Cut D, on the west bank, upstream of the 21st Street Bridge would result in approximately 437,000 cy of spoil material which would be open-lake disposed. The major portion of the bank would have a IV:4H sideslope. Approximately 5.2 acres of land would be lost. According to USFWS, this area is of very limited wildlife value because of prior commercial development. It is presently vacant, thus impacts should be minimal. Approximately 1,100 feet of shallow-water bank habitat would be disturbed.

Business and industries carrying on dock related activities may be disrupted during implementation of the bank cuts. There would be a temporary, short-term increase in employment during construction as well as a temporary degradation of air quality and an increase in noise. These two adverse impacts are expected to be minor since the construction is to be carried out in a highly industrialized area. No significant increases in tax revenue of property values are expected. However, tax revenues would be lost due to the riverbank cuts. Impacts on community or regional growth should be minimal; however, harbor modifications may facilitate plant expansion at U. S. Steel. No people or farms would be displaced.

Evaluation of Alternative 18 - With an overall benefit/cost ratio of 2.1 and with incremental justification of each of the separable features of this plan and since there are no major anticipated adverse environmental impacts expected, Alternative 18 warrants consideration as the selected plan.

ALTERNATIVE 18A (DIRECT DELIVERY TO U. S. STEEL IN 767-FOOT VESSELS - UPRIVER BEND WIDENING - RIVERSIDE PARK CUT)

Description of Alternative 18A - This plan is the same as Alternative 18 except that it adds the separable feature of the Riverside Park Cut. The purposes of the Riverside Park Cut would be to eliminate congestion at the mouth of the Black River and to improve the channel alignment through the Erie Avenue Bridge, thereby reducing the need for tug assistance to 1,000-foot vessels at AmShip.

The additional construction items associated with this plan are as follows. The east basin will require dredging to provide a new channel approach for the park cut (Construction Item 5). Excavation is required for the Riverside Park Cut (Construction Item 6) and sheetpile bulkheading is required to stabilize the cut (Construction Items 7 and 8). A sheetpile cell river diversion will also be provided (Construction Item 9) to provide access and divert river flows through the new channel. Also a portion of the west bank immediately upstream of the Erie Avenue Bridge would have to be removed (Construction Item 11) in order to provide a straight channel through the Erie Avenue Bridge. These construction features are shown on Plate 28.

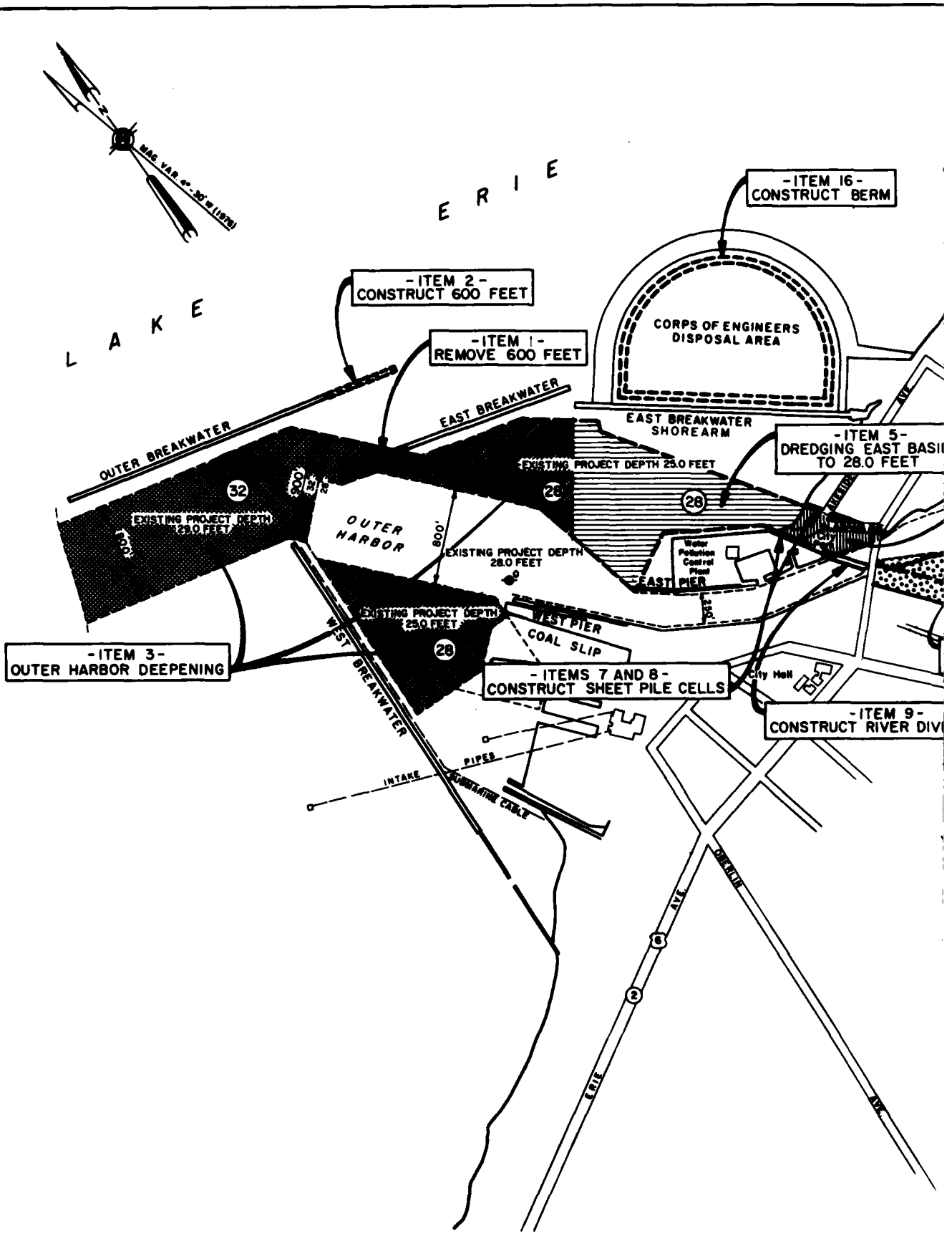
Cost Estimate for Alternative 18A - Table 56 provides a summary of the estimated first cost and cost apportionment for Alternative 18A. A detailed breakdown of the estimate is contained in Appendix C. The total estimated first cost for this alternative is $61,261,000. Under traditional cost apportionment, the Fedral share would be $50,767,000 and the non-Federal share would be $10,494,000. Based on the President's proposed cost-sharing, non-Federal interests would finance the entire cost of $61,261,000.

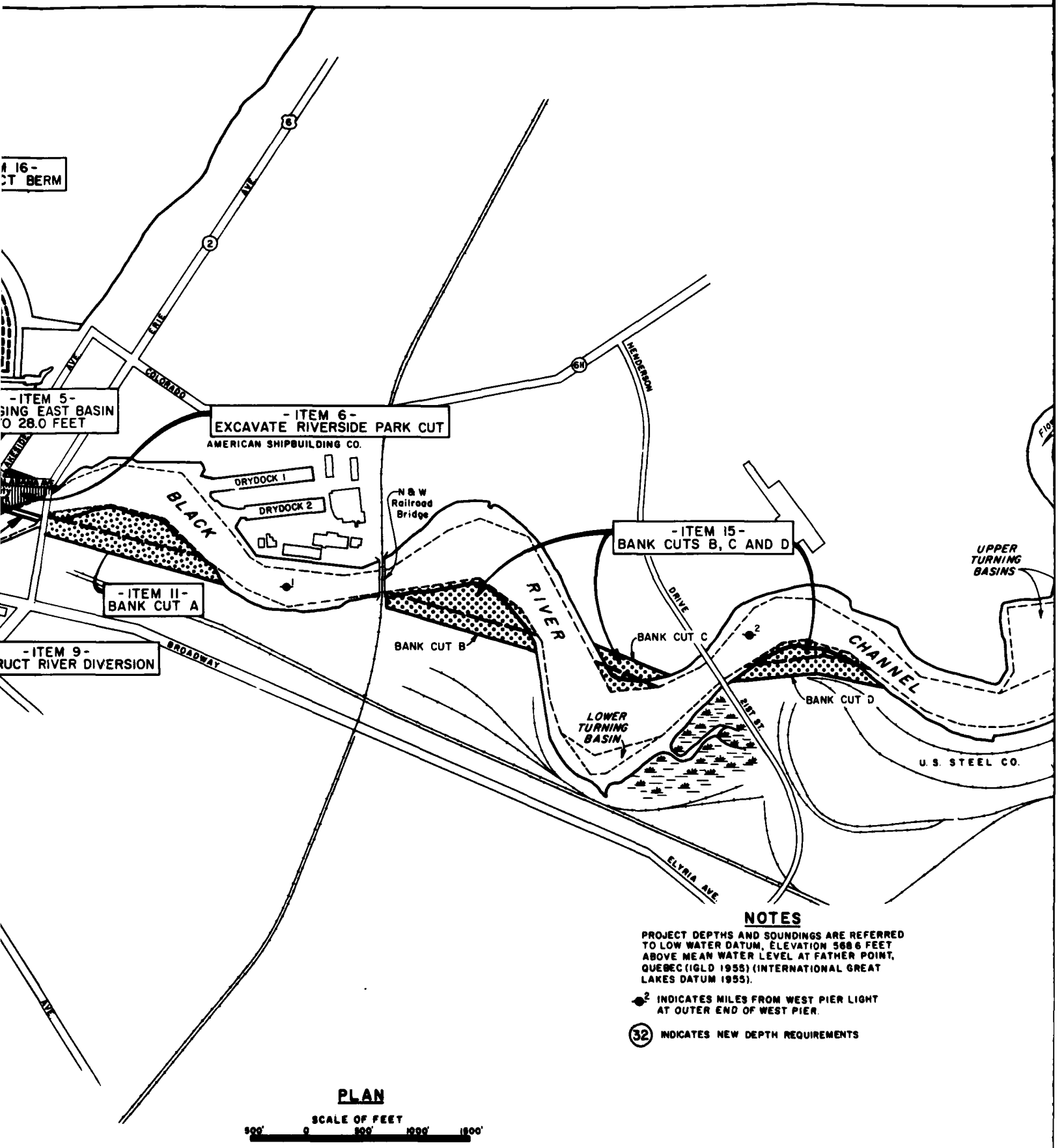
Table 57 presents the average annual charges for this alternative, using both the traditional and proposed cost apportionment methods. The total annual charges, including annual operation and maintenance costs for this plan, are estimated to be approximately $6,248,000.

The 50 percent Federal, 50 percent non-Federal cost apportionment for Construction Item 15 (Bank Cut B, C, and D) has been previously detailed at the beginning of this section of the Main Report.

Economic Evaluation of Alternative 18A - Alternative 18A is the same plan as Alternative 18 except that it contains the Riverside Park Cut feature. As was required for the other two alternatives containing this feature (Alternatives 9A and 10A), incremental justification of the park cut is required in addition to total project justification. Therefore, this economic evaluation will assess the total project and the incremental evaluation of the park cut.

As shown in Table 57, the total investment cost for Alternative 18A is $67,013,000. Amortizing this cost and including annual operation and maintenance costs, the total annual charges for this alternative are $6,248,000.


MAG. VAR. 4° 30' W (1978)
LAKE ERIE
-ITEM 16-
CONSTRUCT BERM
-ITEM 2-
CONSTRUCT 600 FEET
-ITEM 1-
REMOVE 600 FEET
CORPS OF ENGINEERS
DISPOSAL AREA
EAST BREAKWATER
SHOREARM
OUTER BREAKWATER
EAST BREAKWATER
-ITEM 5-
DREDGING EAST BASI
TO 28.0 FEET
EXISTING PROJECT DEPTH 25.0 FEET
EXISTING PROJECT DEPTH
23.0 FEET
OUTER
HARBOR
800'
EXISTING PROJECT DEPTH
28.0 FEET
EAST PIER
EXISTING PROJECT DEPTH
23.0 FEET
WEST PIER
COAL SLIP
-ITEM 3-
OUTER HARBOR DEEPENING
-ITEMS 7 AND 8-
CONSTRUCT SHEET PILE CELLS
City Hall
-ITEM 9-
CONSTRUCT RIVER DIVI
WEST BREAKWATER
PIPES
INTAKE
ERIE
AVE.



NOTES

PROJECT DEPTHS AND SOUNDINGS ARE REFERRED TO LOW WATER DATUM, ELEVATION 568.6 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (IGLD 1955) (INTERNATIONAL GREAT LAKES DATUM 1955).

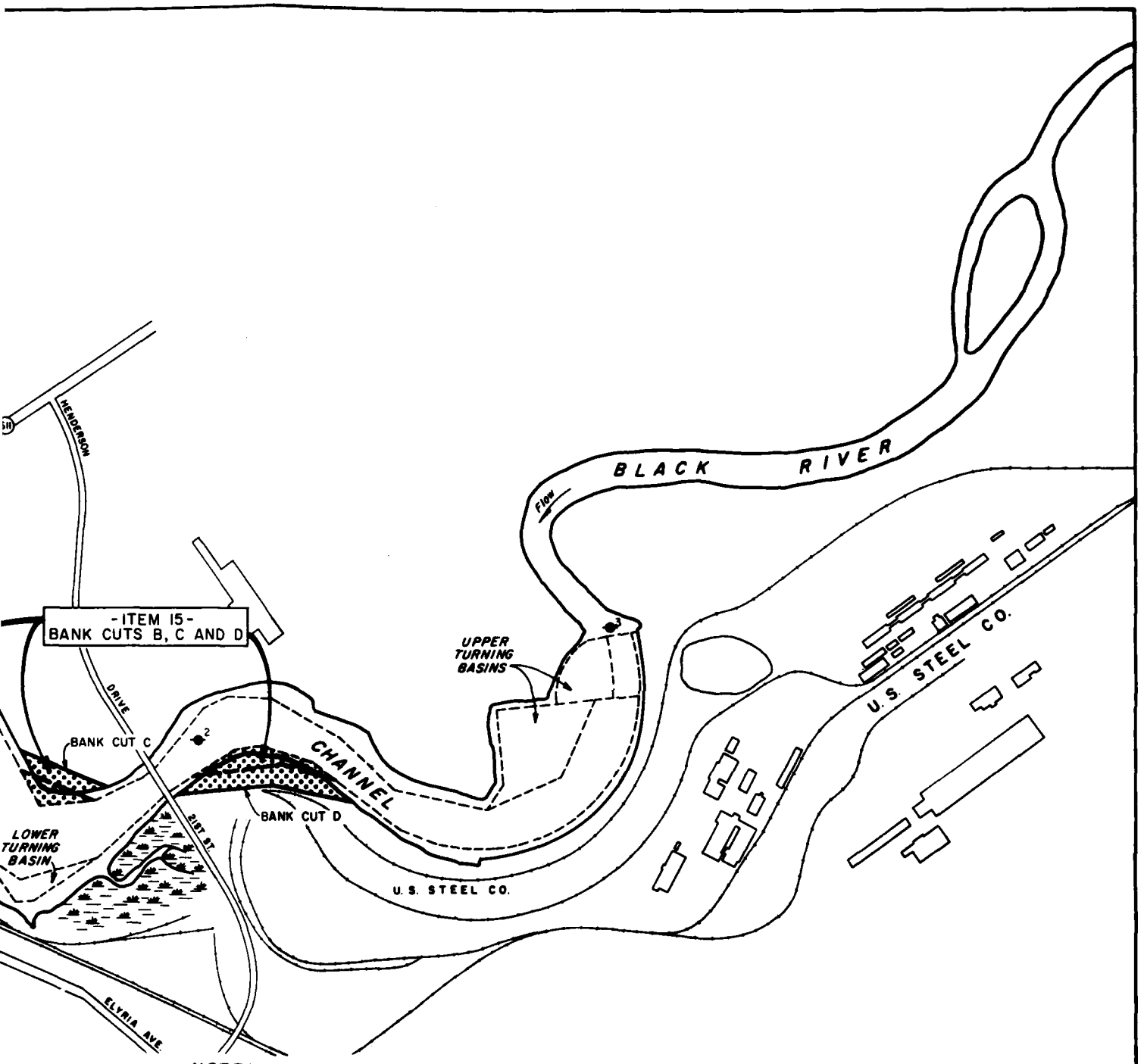
●² INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER.

(32) INDICATES NEW DEPTH REQUIREMENTS

PLAN

SCALE OF FEET

500' 0 500' 1000' 1500'



NOTES

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●² INDICATES MILES FROM WEST PIER LIGHT AT OUTER END OF WEST PIER.

(32) INDICATES NEW DEPTH REQUIREMENTS

LORAIN HARBOR, OHIO
LORAIN HARBOR STUDY
ALTERNATIVE 18A
DIRECT DELIVERY 767 FOOT VESSELS RIVERSIDE PARK CUT
U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 1983

Table 56 - Estimate of First Cost for Alternative 18A

Construction Item	Total Project Cost (1)	Traditional Cost Apportionment (3): Federal Share	Traditional Cost Apportionment (3): Non-Federal Share	President's Proposed Cost Apportionment (4): Federal Share	President's Proposed Cost Apportionment (4): Non-Federal Share
	$	$	$	$	$
1. Removal of 600 feet of East Breakwater	2,128,000	2,128,000	0	0	2,128,000
2. Construct 600 feet to Outer Breakwater	3,297,000	3,297,000	0	0	3,297,000
3. Dredging Outer Harbor	9,976,000	9,976,000	0	0	9,976,000
5. Dredging East Basin	12,136,000	12,136,000	0	0	12,136,000
6. Excavation - Riverside Park Cut	2,980,000	2,980,000	0	0	2,980,000
7. Sheetpile Cells - East Bank of Park Cut and Northern 213.5 feet of West Bank	1,744,000	0	1,744,000	0	1,744,000
8. Sheetpile Cells - Southern 225 feet of West Bank of Park Cut	1,972,000	0	1,972,000	0	1,972,000
9. Sheetpile Cells - River Diversion and Bridge	1,715,000	1,715,000	0	0	1,715,000
11. Bank Cut A	8,298,000	8,298,000	0		8,298,000
15. Bank Cuts B, C, D (2)	5,924,000	2,962,000	2,962,000		5,924,000
16. Berm Construction - Diked Disposal Area	121,000	0	121,000	0	121,000
Subtotal	50,291,000	43,492,000	6,799,000	0	50,291,000
Engineering & Design	4,023,000	3,460,000	563,000	0	4,023,000
Supervision & Administration	4,436,000	3,815,000	621,000	0	4,436,000
Lands	2,511,000	0	2,511,000	0	2,511,000
TOTAL FIRST COSTS	61,261,000	50,767,000	10,494,000	0	61,261,000

(1) December 1981 price levels.
(2) 50-50 Cost sharing for this item.
(3) Cost for general navigation features (Construction Items 1, 2, and 3) are 100 percent Federal.
(4) Total cost for construction is 100 percent non-Federal.

Table 57 - Estimated Investment Cost and Annual Charges - Alternative 18A

Item	Total Project Cost (1)	Traditional Cost Apportionment (3)		Proposed Cost Apportionment (4)	
		Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
	$	$	$	$	$
Total First Costs, Excluding Lands	58,750,000	50,767,000	7,983,000	0	58,750,000
Interest During Construction	5,752,000	4,947,000	805,000	0	5,752,000
Lands	2,511,000	0	2,511,000	0	2,511,000
Total Investment, Including Lands	67,013,000	55,714,000	11,299,000	0	67,013,000
ANNUAL CHARGES FOR THE PROJECT					
Amortization (2)	5,242,000	4,359,000	884,000	0	5,242,000
Operation & Maintenance	1,006,000	864,000	141,000	0	1,006,000
TOTAL ANNUAL CHARGES	6,248,000	5,223,000	1,025,000	0	6,248,000

(1) December 1981 Price Levels.
(2) 7-5/8 percent Interest Rate, 50-year Project Life, Amortization Factor is 0.07823.
(3) Costs for general navigation features are 100 percent Federal.
(4) Total cost for constructionis 100 percent non-Federal.

The benefits associated with Alternative 18A are detailed in Appendix B (Table B57) and are summarized below:

Category	Average Anuual Benefits (1)
	$
Upriver Iron Ore	2,625,000
Upriver Limestone	165,000
Lakefront Iron Ore	2,711,000
Shipyard Activities	149,000
Black River Congestion	680,000
TOTAL BENEFITS FOR ALTERNATIVE 18A	6,330,000

(1) December 1981 price levels.

Table 58 below summarizes the average annual benefits, average annual charges, net average annual benefits and the benefit/cost ratio for Alternative 18A.

Table 58 - Summary of Benefits and Costs - Alternative 18A

	Average Annual Benefits (1)	Average Annual Charges	Net Average Annual Benefits	Benefit/Cost Ratio
	$	$	$	
Total Project	6,330,000	6,248,000	82,000	1.01

(1) December 1981 price levels, and 7-5/8 percent interest rate.

With a benefit/cost ratio of 1.01 Alternative 18A exhibits economic feasibility. As part of the economic evaluation, consideration must be given to assessing viability of the Riverside Park Cut feature.

Economic Justification of Separable Features of Alternative 18A - Construction of the Riverside Park Cut would eliminate congestion at the mouth of the Black River and improve the channel alignment through the Erie Avenue Bridge which would reduce the need for tug-assistance for 1,000-foot vessels entering or leaving the AmShip facilities. The construction of the new channel and related construction items for Alternative 18A which were not required for Alternative 18 would require large additional expenditures. A detailed estimate of these incremental costs of the separable features is presented in Table 59. As shown, the estimated total first cost of the incremental costs between Alternatives 18A and 18 amounts to $35,071,000.

Table 59 - Estimate of Incremental Costs of Alternative 18A (1)

Construction Item	Total Cost
	$
5. Credging East Basin	12,136,000
6. Excavation - Riverside Park Cut	2,980,000
7. Sheet Pile Cells - East Bank of Park Cut and Northern 213.5 Feet of West Bank	1,744,000
8. Sheet Pile Cells - Southern 225 Feet of West Bank of Park Cut	1,972,000
9. Sheet Pile Cells - River Diversion and Bridgeq	1,715,000
11. Bank Cut A	8,298,000
SUBTOTAL	28,845,000
Engineering and Design	2,308,000
Supervision and Administration	2,544,000
Lands	1,374,000
TOTAL INCREMENTAL FIRST COST	35,071,000

(1) December 1981 price levels.

Table 60 shows the average annual charges including annual operation and maintenance costs for the incremental costs associated with Alternative 18A. These incremental annual charges amount to $3,622,000.

Table 60 - Estimated Incremental Investment Cost and Annual Charges for Alternative 18A (1)

Item	Total Project Cost
	$
Total First Cost, Excluding Lands	33,697,000
Interest During Construction	3,854,000
Lands	1,374,000
Total Investment, Including Lands	38,925,000
Annual Charges	
Amortization (2)	3,045,000
Operation and Maintenance	577,000
TOTAL INCREMENTAL ANNUAL CHARGES	3,622,000

(1) December 1981 price levels.
(2) 7-5/8 percent interest rate, 50-year life, amortization factor is 0.07823.

Comparing benefit categories for Alternatives 18A and 18, Alternative 18A has the additional categories for relief of Black River congestion ($680,000 annually) and shipyard activities ($149,000 annually). These two additional

categories amount to $829,000 and are the incremental increase in benefits associated with the Riverside Park Cut.

Table 61 summarizes the incremental benefits, charges, net annual benefits, and the benefit/cost ratio associated with the development of the separate features of the Riverside Park Cut.

Table 61 - Incremental Justification - Separable Features of Alternative 18A (1)

	Total Annual Benefits	Total Annual Charges	Net Annual Benefits	Benefit/Cost Ratio
	$	$	$	
Incremental Value for Separable Features of Alternative 18A	829,000	3,622,000	-2,793,000	0.23

As shown in Table 61, the incremental net benefits for the incremental features of Alternative 18A amount to a negative $2,793,000. With a benefit/cost ratio of 0.23, the incremental feature of Alternative 18A, the Riverside Park Cut, is not economically justified.

Environmental Features/Assessment of Alternative 18A - Alternative 18A is similar to Alternative 18 except that it includes a cut through Riverside Park as discussed under Alternative 9A and a cut on the west bank upstream of the Erie Avenue Bridge, as discussed below.

Outer Harbor improvements would be similar to those discussed under Alternatives 9A and 10A.

The bank cut upstream of the Erie Avenue Bridge (Cut A) would result in approximately 505,000 cy of saturated, nonpolluted dredged material, and approximately 705,000 cy of nonsaturated excavated material for a total of 1,210,000 cy. The sideslope would be IV:3H. The land taken to provide this cut (approximately 12.5 acres) is presently vacant and sparsely vegetated, thus impacts should be minimal. Approximately 1,500 feet of shallow-water bank habitat would be disturbed. The soil in this area is designated as prime farmland by the U. S. Conservation Service. Because this land is located in a commercial/industrial area, there is little chance it would ever be used as farmland. Therefore, no impacts in this regard are expected.

Impacts of Bank Cuts B, C, and D would be similar to those as discussed under Alternative 18. Businesses and industries carrying on dock-related activities may be disrupted during implementation of the bank cuts. There would be a temporary, short-term increase in employment during construction, as well as, a temporary degradation of air quality and an increase in noise. These two adverse impacts are expected to be minor, since the construction is to be carried out in a highly industrialized area. No significant increases in tax revenue or property values are expected. However, tax revenues would be lost due to the four riverbank cuts and the Riverside Park Cut. Impacts on

community or regional growth should be minimal, but harbor modifications may facilitate plant expansion at U. S. Steel. There would be no displacement of farms if this alternative is implemented. However, approximately three homes would have to be relocated due to the Riverside Park Cut.

Since the Riverside Park Cut was found to be not economically justified, plans were not developed in the detail necessary to determine if major sanitary sewer relocation would be required for the truck line to the Lorain Wastewater Treatment Plant. For the same reason, impacts of river diversion upon effluent mixing and discharge has not been evaluated.

Evaluation of Alternative 18A - Even though the overall plan is economically justified with a benefit/cost ratio of 2.01, the separable feature of the Riverside Park Cut does not exhibit economic feasibility with a B/C ratio of 0.23. For this reason, further consideration of this plan is not warranted.

ALTERNATIVE 17 (NO ACTION)

Description of Alternative 17 - The No Action (Do Nothing) Alternative for Lorain Harbor represents the base condition for evaluation of the six previous alternatives. This plan would allow existing cargo movements to continue to be accommodated within the present Federal project. It assumes continued harbor maintenance, but does not provide for further harbor modifications needed for safe and efficient operation of 1,000-foot vessels. This means bulk cargo will continue to be transported in vessels limited in size and operating draft by the current channel depths and alignment. For the Outer Harbor entrance, the "Base Case" vessel is a light loaded Class 10 vessel, and for the Black River channel, a light loaded Class 8 vessel. As vessel traffic increases in response to projected increases in bulk cargo tonnage, existing problems related to safe and efficient navigation would intensify. This alternative, referred to as the "Base Case," provides a basis for calculating the transportation savings that would result if alternative improvements were implemented.

This alternative is not favored by local interests because it does not meet the planning objectives of improving conditions for commercial navigation by Class 10 vessels. The problems and needs stated earlier would still remain.

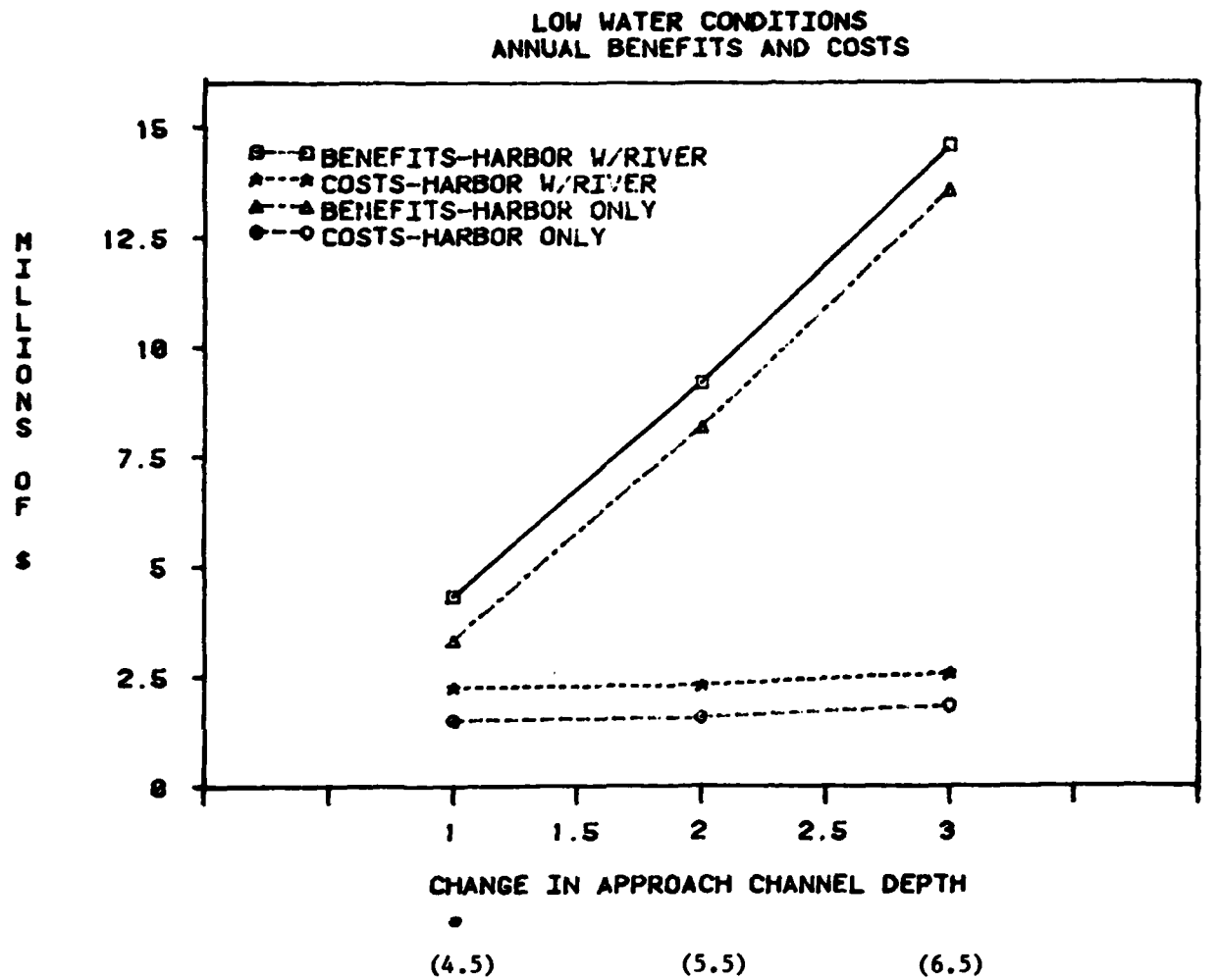
COMPLIANCE WITH ENVIRONMENTAL PROTECTION STATUTES

Preservation of Historical Archaeological Data Act of 1974 - Not applicable.

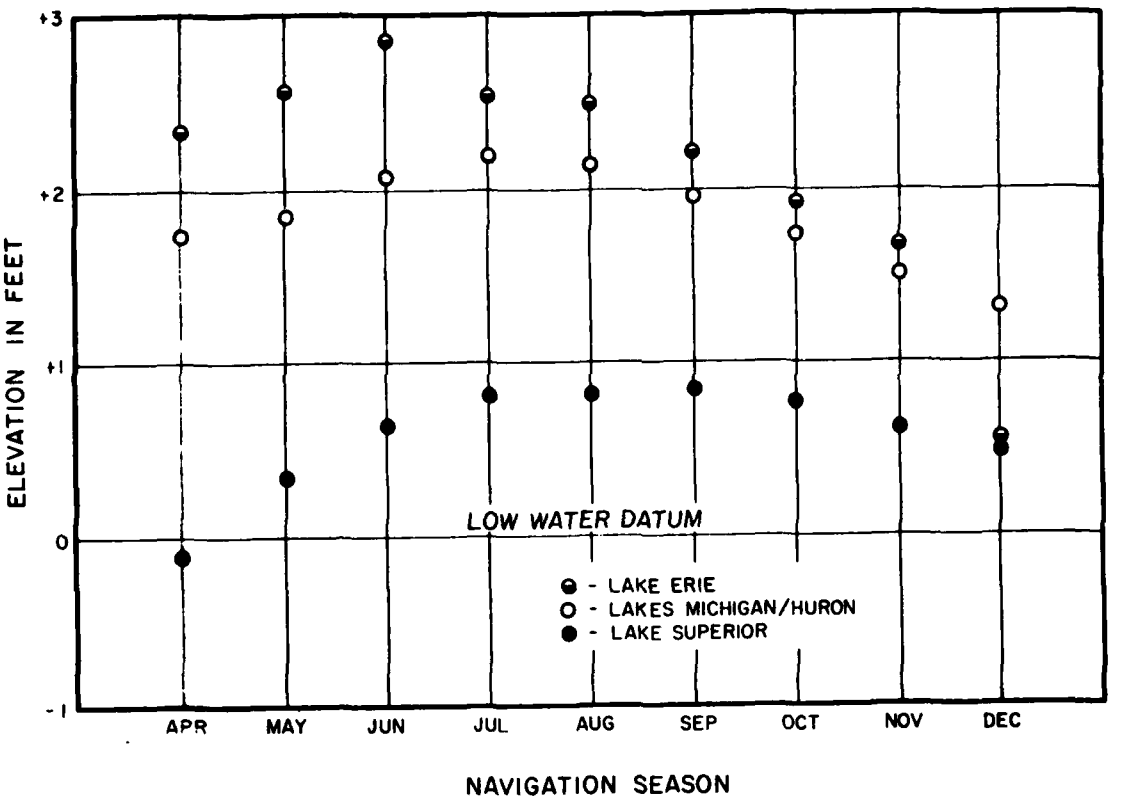
Clean Air Act - Full compliance with this act will be accomplished by transmission of the EIS to the regional Administrator of the U. S. Environmental Protection agency for review and comment.

Clean Water Act of 1977 - Requires that evaluation of the effects of the deposition of dredged or fill materials into waters of the United States be accomplished. The Buffalo District is currently investigating the proposed deposition of material into the waters of the United States. If sufficient

FIGURE 3



DESIGN CRITERIA FOR LAKE APPROACH CHANNEL



VARIATION AND SEASONALITY
AVERAGE MONTHLY LAKE STAGE (1900 - 1976)

FIGURE 4

FIGURE 4

detail of the plans is available at the Final Feasibility stage of the study, a Section 404 Evaluation will be prepared. If it is found that there are gaps in the data, the 404 will be prepared at the AE&D stage of the study.

Coastal Zone Management Act of 1972 - The State of Ohio does not currently have an approved Coastal Zone Plan. However, the Ohio Department of Natural Resources (ODNA) is responsible for preparation of the plan. The Buffalo District is fully coordinating this study with ODNR.

Endangered Species Act of 1973 - Based on coordination with the Regional Director of the U. S. Fish and Wildlife Service, no endangered or threatened species would be adversely affected by this project. Coordination with ODNR has identified a State endangered species, the Silver lamprey (Ichthyomyzon unicuspis) which was collected approximately 3,000 feet upstream from the mouth of the Black River. The continual existence of this species would not be jeopardized by any of the proposed alternatives.

Federal Water Project Recreation Act

In planning the proposed project, full consideration has been given to opportunities afforded by the project for outdoor recreation and fish and wildlife enhancement. Review copies of the Main Report and EIS will be provided to the Department of the Interior in regard to recreation and fish and wildlife activities for conformance with the comprehensive nationwide outdoor recreation plan formulated by the Secretary of the Interior.

Fish and Wildlife Coordination Act - Coordination with the U. S. Fish and Wildlife Service and ODNR has been maintained throughout the study. All concerns with respect to fish and wildlife resources have been identified and all recommendations have been addressed in the Main Report.

National Historic Preservation Act - Based on coordination with the Regional Archaeological Preservation Office - Cleveland, there are no potentially significant sites which would be impacted by any of the project alternatives, and this act is complied with for the Lorain Harbor study.

National Environmental Policy Act - The Lorain Harbor study is in full compliance with this act for the current stage of planning.

River and Harbor Act - The requirements of this act are fulfilled by Corps planning actions.

Wild and Scenic Rivers Act - Not applicable.

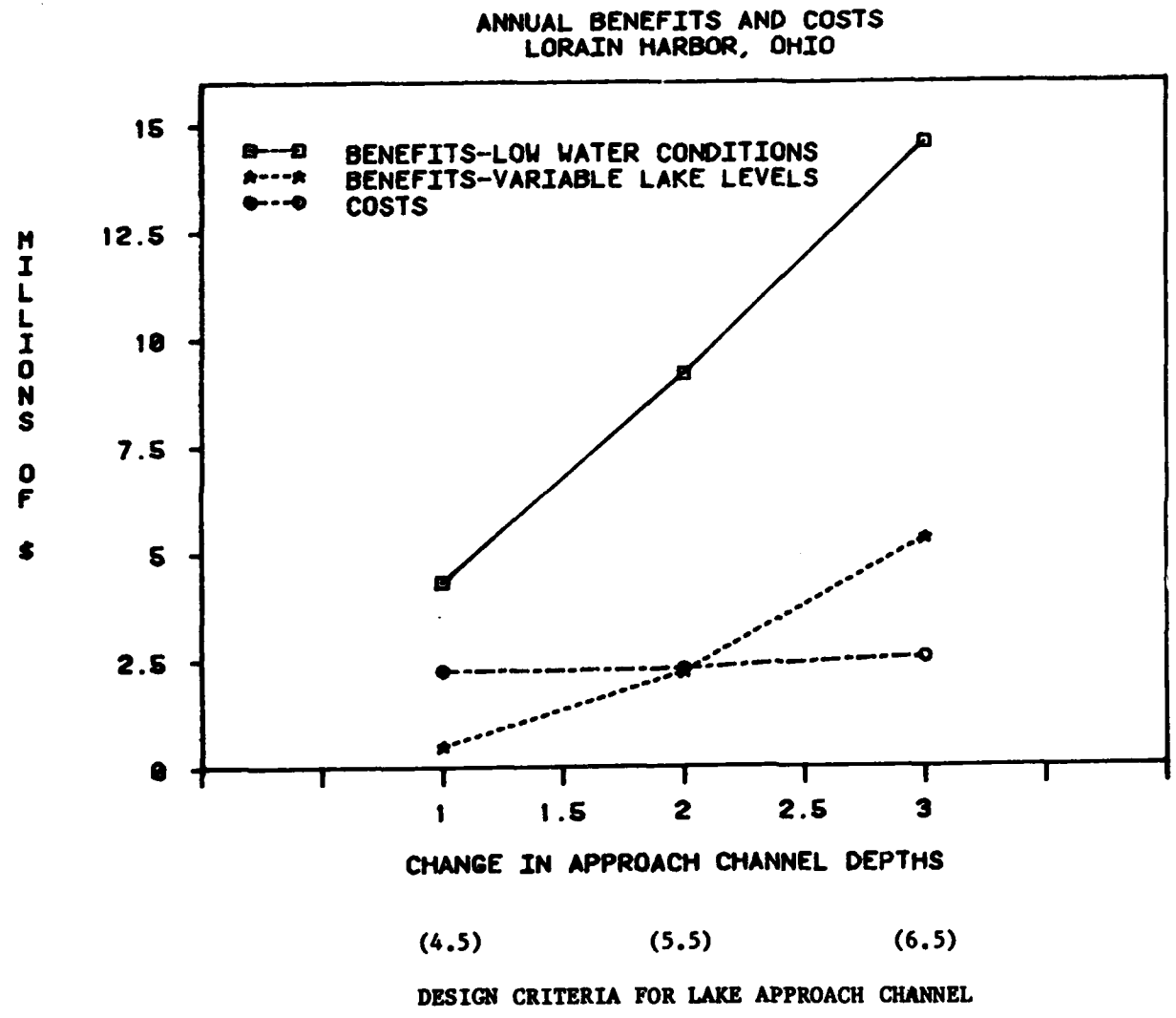
Executive Order 11988, Flood Plain Management - This Executive Order requires that Federal agencies avoid development in base flood plains unless no practicable alternative to such development exists. The Corps of Engineers has concluded that there is no practicable alternative to the proposed action which will occur in the base flood plain of the Black River and that the proposed alternatives are in compliance with Executive Order 11988, Flood Plain Management.

Executive Order 11990, Protection of Wetlands - According to Corps of Engineers regulations (33 CFR 235.4 (c)), wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at frequency and duration sufficient to support, and that under normal circumstances do support a prevailance of vegetation typically adapted for in soil conditions." Since the alternatives considered in detail would not affect any areas such as these, this Executive Order is complied with for the Lorain Harbor Study.

Table 61a - Summary of Benefits and Costs, Lorain Harbor, OH

Alternative 18 - Low Water Conditions										
			Average Annual Transportation Savings ($M)		Average Annual Project Costs ($M)		Average Annual Net Benefits ($M)		Benefit-to-Cost Ratio	
Design Underkeel Clearance (feet)	Maximum Operating Drafts (feet)	Deepening Requirement (feet)	Outer Harbor Only $	Outer Harbor with Black River (1) $	Outer Harbor Only $	Outer Harbor with Black River $	Outer Harbor Only $	Outer Harbor with Black River $	Outer Harbor Only	Outer Harbor with Black River
6.5	22.5	+3	13.557	14.557	1.837	2.579	11.720	11.978	7.38	5.64
5.5	23.5	+2	8.176	9.176	1.575	2.317	6.601	6.859	5.19	3.96
4.5	24.5	+1	3.328	4.328	1.509	2.251	1.819	2.077	2.21	1.92

FIGURE 5


ANNUAL BENEFITS AND COSTS
LORAIN HARBOR, OHIO
BENEFITS-LOW WATER CONDITIONS
BENEFITS-VARIABLE LAKE LEVELS
COSTS
MILLIONS OF $
15
12.5
10
7.5
5
2.5
0
1
1.5
2
2.5
3
CHANGE IN APPROACH CHANNEL DEPTHS
(4.5)
(5.5)
(6.5)
DESIGN CRITERIA FOR LAKE APPROACH CHANNEL

COMPARISON OF DETAILED PLANS

Evaluation and assessment of plans recommended for additional detailed study at the conclusion of preliminary planning indicated that four plans should be developed in detail (Alternatives 9, 9A, 10, 10A). Based on information gathered subsequent to completing the Preliminary Feasibility Report, two additional plans were developed (Alternatives 18 and 18A). These six plans were then studied in detail as presented in this report. Another plan, Alternative 17, the No Action (Do Nothing) Plan, was included as the "basis of comparison" to the six structural plans and as a candidate for the "Selected Plan" in the event none of the structural plans are implementable. This section compares the impacts of the six structural plans to the No Action Plan and discusses the rationale for designation of a National Economic Development (NED) Plan and an Environmental Quality (EQ) Plan, and the candidate(s) Selected Plan(s).

COMPARISON OF DETAILED PLANS

Table 62, Summary of Effects, compares the impacts of the six structural plans (Alternatives 9, 9A, 10, 10A, 18, and 18A) to the No Action Plan, Alternative 17. Impacts are evaluated and displayed or accounted for in terms of contributions to four accounts: National Economic Development (NED), Environmental Quality (EQ), Regional Economic Development (RED), and Other Social Effects (OSE).

SELECTING THE NED AND EQ PLANS

The principles, standards, and criteria of plan formulation and evaluation require that alternatives be measured to determine their efficiency in meeting the objectives of the plan formulation process. A National Economic Development (NED) Plan must be identified in the evaluation process. The NED Plan must, from the national point of view, represent the best return on the investment of economic resources needed for construction. The Environmental Quality (EQ) Plan is the alternative plan that contributes the greatest net benefits to the quality of the environment. If none of the plans under consideration provide positive net benefits to the quality of the environment, that plan which is least environmentally damaging should then be identified.

RATIONALE FOR DESIGNATION OF THE NED PLAN

In selecting the National Economic Development Plan, candidate plans must not only satisfy the planning objectives and evaluation criteria, they

Table 62 - Summary of Effects for Alternatives 9, 9A, 10, 10A, 18, 18A, and 17

	Alternative 9	Alternative 9A	Alternative 10	Alternative 10A	Alternative 18	Alternative 18A	Alternative 17
1. Plan Description	Lakefront Transshipment a. Outer Harbor Mode. b. Lakefront Transshipment Facility c. Upriver Conveyor System	Transshipment from Erie Avenue Bridge Near a. Outer Harbor Mode. b. Riverside Park Cut c. Erie Avenue Transshipment Facility d. Upriver Conveyor System	Lakefront Transshipment a. Outer Harbor Mode. b. Lakefront Transshipment Facility c. Special Purpose Vessel Upriver	Transshipment from Erie Avenue Bridge Near a. Outer Harbor Mode. b. Erie Avenue Transshipment Facility c. Riverside Park Cut d. Special Purpose Vessel Upriver	Direct Delivery in Class 8 a. Outer Harbor Mode. b. Upriver Bend Cuts	Direct Delivery in Class 8 a. Outer Harbor Mode. b. Riverside Park Cut c. Upriver Bend Cuts	No Action
2. National Economic Development (1)							
a. Beneficial Impacts							
(1) Total Annual Benefits	$12,715,000	$ 14,403,000	$12,808,000	$14,496,000	$5,501,000	$6,330,000	$ 0
b. Adverse Impacts							
(1) Traditional Cost-Sharing Method (2)							
(a) Total Investment Cost							
Federal	$ 20,024,000	$ 54,733,000	$ 19,993,000	$ 54,743,000	$ 23,108,000	$ 55,714,000	$ 0
Non-Federal	57,943,000	53,689,000	76,075,000	69,838,000	4,378,000	11,299,000	0
Total	$ 77,967,000	$108,422,000	$ 96,068,000	$124,581,000	$ 27,486,000	$ 67,013,000	$ 0
(b) Annual Charges							
Federal	$ 1,876,000	$ 5,257,000	$ 1,904,000	$ 5,258,000	$ 2,177,000	$ 5,223,000	$ 0
Non-Federal	5,449,000	5,014,000	6,883,000	6,297,000	402,000	1,025,000	0
Total	$ 7,325,000	$ 10,271,000	$ 8,792,000	$ 11,555,000	$ 2,579,000	$ 6,248,000	$ 0
(2) President's Proposed Cost-Sharing Method (3)							
(a) Total Investment Cost							
Federal	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Non-Federal	77,967,000	108,422,000	96,068,000	124,581,000	27,486,000	67,013,000	0
Total	$ 77,967,000	$108,422,000	$ 96,068,000	$124,581,000	$ 27,486,000	$ 67,013,000	$ 0
(b) Annual Charges							
Federal	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Non-Federal	7,325,000	10,271,000	8,792,000	11,555,000	2,579,000	6,248,000	0
Total	$ 7,325,000	$ 10,271,000	$ 8,792,000	$ 11,555,000	$ 2,579,000	$ 6,248,000	$ 0
c. Economic Efficiency							
(1) Net Annual Benefits	$ 5,390,000	$ 4,132,000	$ 4,016,000	$ 2,941,000	$ 2,922,000	$ 82,000	$ 0
(2) B/C Ratio	1.7	1.4	1.5	1.3	2.1	1.01	0
3. Environmental Quality							
a. Beneficial Impacts							
(1) Biological Impacts							
(a) Breakwater	Aquatic habitat provided 1.25 acres	Aquatic habitat provided 1.25 acres	Aquatic habitat provided 1.25 acres	Aquatic habitat provided 1.25 acres	Aquatic habitat provided 1.25 acres	Aquatic habitat provided 1.25 acres	None
(b) Outer Harbor	None	None	None	None	None	None	None
(c) River	None	Aquatic habitat provided 17.9 acres (low value)	None	Aquatic habitat provided 17.9 acres (low value)	Aquatic habitat provided 12.0 acres	Aquatic habitat provided 29.9 acres (5.4 acres of low value)	None
(d) Threatened and Endangered Species	None	None	None	None	None	None	None
(e) Terrestrial	None	None	None	None	None	None	None
(f) Wetlands	None	None	None	None	None	None	None

Table 62 - Summary of Effects for Alternatives 9, 9A, 10, 10A, 18, 18A, and 17

	Alternative 9	Alternative 9A	Alternative 10	Alternative 10A	Alternative 18	Alternative 18A	Alternative 17
(2) Air Quality	None	None	None	None	None	None	Improved due to abatement progress
(3) Water Quality	None	None	None	None	None	None	Improved due to abatement progress
(4) Erosion	None	None	None	None	None	None	None
b. Adverse Impacts							
(1) Biological Impacts							
(a) Breakwater	Aquatic habitat lost: 1.22 acres	Aquatic habitat lost: 1.22 acres	Aquatic habitat lost: 1.22 acres	Aquatic habitat lost: 1.22 acres	Aquatic habitat lost: 1.22 acres	Aquatic habitat lost: 1.22 acres	None
(b) Outer Harbor	Loss of 20 acres of previously undredged habitat	Loss of 32 acres of previously undredged habitat	Loss of 20 acres of previously undredged habitat	Loss of 32 acres of previously undredged habitat	Loss of 20 acres of previously undredged habitat	Loss of 32 acres of previously undredged habitat	None
(c) River	None	Loss of 1,500 feet of shallow water habitat	Loss of 700 feet of shallow water habitat	Loss of 1,500 feet of shallow water habitat	Disturbance of 2,800 feet of shallow water habitat	Disturbance of 4,300 feet of shallow water habitat	None
(d) Threatened and Endangered Species	None	None	None	None	None	None	None
(e) Terrestrial	Disturbance due to conveyor construction and cargo stockpiles	Loss of 12.5 acres (commercial land) and loss of Riverside Park (5.40 acres). Disturbance due to conveyor construction and cargo stockpiles.	Disturbance due to conveyor construction (to a lesser degree than Alternative 9) and cargo stockpiles.	Loss of 12.5 acres (commercial land) and loss of Riverside Park (5.40 acres). Disturbance due to conveyor construction to a lesser degree than Alternative 9A.	Loss of 12.0 acres (7.7 of low value to wildlife).	Loss of 24.5 acres (20.2 of low value to wildlife). Loss of Riverside Park (5.4 acres).	None
(f) Wetlands	None	None	None	None	None	None	None
(2) Air Quality	Temporary decrease during construction. Possible significant decrease if steel plant expands. Minor decrease from dust from conveyors.	Temporary decrease during construction. Possible significant decrease if steel plant expands. Minor decrease from dust from conveyors.	Temporary decrease during construction. Possible significant decrease if steel plant expands.	Temporary decrease during construction. Possible significant decrease if steel plant expands.	Temporary decrease during construction. Possible significant decrease if steel plant expands.	Temporary decrease during construction. Possible significant decrease if steel plant expands.	None
(3) Water Quality	Temporary decrease during construction. Possible decrease if steel plant expands.	Temporary decrease during construction. Possible decrease if steel plant expands.	Temporary decrease during construction. Possible decrease if steel plant expands.	Temporary decrease during construction. Possible decrease if steel plant expands.	Temporary decrease during construction. Possible decrease if steel plant expands.	Temporary decrease during construction. Possible decrease if steel plant expands.	None
(4) Erosion	None	None	None	None	None	None	None
4. Other Social Effects							
a. Beneficial Impacts							
(1) Noise	Decrease as fewer ships utilize channel reducing vessel noise and horn soundings to pass Erie Avenue Bridge.	Decrease as fewer ships utilize channel reducing vessel noise.	Decrease in vessel horn soundings to pass Erie Avenue Bridge.	Decrease as fewer ships utilize channel reducing vessel noise.	None	None	None
(2) Aesthetic Values	None	None	None	None	None	None	None
(3) Community Cohesion	None	None	None	None	None	None	None
(4) Community and Regional Growth	Allows for 1,000-foot vessels to enter the Outer Harbor. New transshipment facility. Possible expansion for U. S. Steel.	Allows for 1,000-foot vessels to enter the Outer Harbor. New transshipment facility. Possible expansion for U. S. Steel. Easier access for larger vessels to Amship - possible expansion.	Allows for 1,000-foot vessels to enter the Outer Harbor. New transshipment facility. Possible expansion for U. S. Steel.	Allows for 1,000-foot vessels to enter the Outer Harbor. New transshipment facility. Possible expansion for U. S. Steel. Easier access for larger vessels to AmShip -- possible expansion.	Allows for 1,000-foot vessels to enter Outer Harbor and 767-foot vessels to travel upriver. Possible expansion for U. S. Steel.	Allows for 1,000-foot vessels to enter Outer Harbor and 767-foot vessels to travel upriver. Possible expansion for U. S. Steel. Easier access for larger vessels to Amship - possible expansion.	Possible slight increase.
(5) Business and Industrial Activity	Possible increase in steel and other product output due to easing of shipping constraints.	Possible increase in steel and other product output due to easing of shipping constraints.	Possible increase in steel and other product output due to easing of shipping constraints.	Possible increase in steel and other product output due to easing of shipping constraints.	Possible increase in steel and other product output due to easing of shipping constraints.	Possible increase in steel and other product output due to easing of shipping constraints.	Possible minor increase.

Table 62 - Summary of Effects for Alternatives 9, 9A, 10, 10A, 18, 18A, and 17

	Alternative 9	Alternative 9A	Alternative 10	Alternative 10A	Alternative 18	Alternative 18A	Alternative 17
(6) Employment and Income	Increase due to transhipment facility. U. S. Steel may expand existing facility.	Increase due to transhipment facility. U. S. Steel may expand existing facility.	Increase due to transhipment facility. U. S. Steel may expand existing facility.	Increase due to transhipment facility. U. S. Steel may expand existing facility.	U. S. Steel may expand existing facility.	U. S. Steel may expand existing facility.	Minor increase.
(7) Property Values and Tax Base	Increase due to transhipment facility. Possible increase at U. S. Steel.	Increase due to transhipment facility. Possible increase at U. S. Steel.	Increase due to transhipment facility. Possible increase at U. S. Steel.	Increase due to transhipment facility. Possible increase at U. S. Steel.	Possible increase at U. S. Steel.	Possible increase at U. S. Steel.	Minor increase.
(8) Public Facilities and Services	Increased demand for public facilities and services due to increased commerce, employment, and activity in Lorain.	Increased demand for public facilities and services due to increased commerce, employment, and activity in Lorain.	Increased demand for public facilities and services due to increased commerce, employment, and activity in Lorain.	Increased demand for public facilities and services due to increased commerce, employment, and activity in Lorain.	Increased demand for public facilities and services due to increased commerce, employment, and activity in Lorain.	Increased demand for public facilities and services due to increased commerce, employment, and activity in Lorain.	None
(9) Transportation	1,000-foot vessels able to enter Outer Harbor. Transshipment of material upstream. Less traffic congestion due to fewer openings of Erie Avenue Bridge.	1,000-foot vessels able to enter Outer Harbor and travel upstream of Erie Avenue Bridge. Transshipment of material from this point upriver. Less vessel congestion at river mouth.	1,000-foot vessels able to enter Outer Harbor. Transshipment of material upstream. Less traffic congestion due to fewer openings of Erie Avenue Bridge.	1,000-foot vessels able to enter Outer Harbor and travel upstream of Erie Avenue Bridge. Transshipment of material from this point upriver. Less vessel congestion at river mouth.	1,000-foot vessels able to enter Outer Harbor. 767-foot vessels able to travel entire length of Inner Harbor.	1,000-foot vessels able to enter Outer Harbor and upstream of Erie Avenue Bridge. 767-foot vessels able to travel entire length of Inner Harbor. Less vessel congestion at river mouth.	None
(10) Displacement of People and/or Farms	None	None	None	None	None	None	None
(11) Man-Made Resources	Possible increased output of steel and other man-made resources.	Possible increased output of steel and other man-made resources.	Possible increased output of steel and other man-made resources.	Possible increased output of steel and other man-made resources.	Possible increased output of steel and other man-made resources.	Possible increased output of steel and other man-made resources.	Minor increase in output.
(12) Cultural Resources	None	View of lighthouse from shore temporarily restricted.	None	View of lighthouse from shore temporarily restricted.	None	View of lighthouse from shore temporarily restricted.	None
b. Adverse Impacts							
(1) Noise	Temporary increase during construction. Increase in area of transshipment facility due to machinery operation. Increase due to conveyor operation.	Temporary increase during construction. Increase in area of transshipment facility due to machinery operation. Increase due to conveyor operation.	Temporary increase during construction. Increase in area of transshipment facility due to machinery operation. Increase due to conveyor operation. Conveyor noise lesser to a degree than Alternative 9A.	Temporary increase during construction. Increase in area of transshipment facility due to machinery operation. Increase due to conveyor operation. Conveyor noise lesser to a degree than Alternative 9.	Temporary increase during construction.	Temporary increase during construction.	Slight increase as more ships use harbor.
(2) Aesthetic Values	Decrease due to cargo stockpiles and upriver conveyor.	Decrease due to cargo stockpiles and upriver conveyor.	Decrease due to cargo stockpiles and short conveyor system.	Decrease due to cargo stockpiles and short conveyor system.	None	None	None
(3) Community Cohesion	None	None	None	None	None	None	None
(4) Community and Regional Growth	No channel work would limit commerce to existing conditions.	None	No channel work would limit commerce to existing conditions.	None	None	None	Port would not be able to handle larger vessels.
(5) Business and Industrial Activity	Disruption during conveyor construction.	Disruption during conveyor construction. Loss of 12.5 acres of commercial land presently vacant.	Disruption during conveyor construction due to a lesser degree than Alternative 9.	Disruption during conveyor construction due to a lesser degree than Alternative 9A. Loss of 12.5 acres of commercial land presently vacant.	Loss of 12.0 acres of potential commercial land presently vacant.	Loss of 24.5 acres of potential commercial land presently vacant.	Port would not be able to handle larger vessels.
(6) Employment and Income	None	None	None	None	None	None	None
(7) Property Values and Tax Base	None	Loss of 12.5 acres of taxable land.	None	Loss of 12.5 acres of taxable land.	Loss of 12.0 acres of taxable land.	Loss of 24.5 acres of taxable land.	None
(8) Public Facilities and Services	None	Relocation of utilities.	None	Relocation of utilities.	None	Relocation of utilities.	None
(9) Transportation	None	None	None	None	None	None	None
(10) Displacement of People and/or Farms	None	Relocate three homes.	None	Relocate three homes.	None	Relocate three homes.	None
(11) Man-Made Resources	None	Loss of Riverside Park.	None	Loss of Riverside Park.	None	Loss of Riverside Park.	None
(12) Cultural Resources	None	None	None	None	None	None	None
5. Regional Economic Development							
a. Beneficial Impacts							

Table 62 - Summary of Effects for Alternatives 9, 9A, 10, 10A, 18, 18A, and 17

	Alternative 9	Alternative 9A	Alternative 10	Alternative 10A	Alternative 18	Alternative 18A	Alternative 17
(1) Regional Income	Slight increase due to transshipment facility.	Slight increase due to transshipment facility.	Slight increase due to transshipment facility.	Slight increase due to transshipment facility.	No anticipated change.	No anticipated change.	No change.
(2) Regional Employment	Slight increase due to transshipment facility.	Slight increase due to transshipment facility.	Slight increase due to transshipment facility.	Slight increase due to transshipment facility.	No anticipated change.	No anticipated change.	No change.
6. Other Impacts							
a. Wave Action	Widening of the Outer Harbor entrance channel may cause increased wave action in the Outer Harbor and at the Lakefront.	Widening of the Outer Harbor entrance channel may cause increased wave action in the Outer Harbor and at the Lakefront.	Widening of the Outer Harbor entrance channel may cause increased wave action in the Outer Harbor and at the Lakefront.	Widening of the Outer Harbor entrance channel may cause increased wave action in the Outer Harbor and at the Lakefront.	Widening of the Outer Harbor entrance channel may cause increased wave action in the Outer Harbor and at the Lakefront.	Widening of the Outer Harbor entrance channel may cause increased wave action in the Outer Harbor and at the Lakefront.	No change.
b. Effects in Outer Harbor Development	None	Construction of the Riverside Park Cut would reduce the water area available for a proposed small-boat marina in the east basin of the Outer Harbor.	None	Construction of the Riverside Park Cut would reduce the water area available for a proposed small-boat marina in the east basin of the Outer Harbor.	None	Construction of the Riverside Park Cut would reduce the water area available for a proposed small-boat marina in the east basin of the Outer Harbor.	No change.

(1) Values shown are on December 1981 price levels. Annualized values are based on 7-5/8 percent interest rate and 50-year project life.

(2) Costs for general navigation features are 100 percent Federal.

(3) Total cost for construction is 100 percent non-Federal.

must also maximize net benefits. Based on an evaluation of plans developed during Final Feasibility planning, the results displayed in Table 62 show that Alternative 9 maximizes NED benefits with annual net benefits of $5,390,000. Therefore, Alternative 9 (Lakefront Transshipment-Conveyor Upriver) is designated the NED Plan.

RATIONALE FOR DESIGNATION OF EQ PLAN

Recognizing that environmental quality has both natural and human manifestations, the EQ Plan addresses the planning objectives in a way which emphasizes aesthetic, ecological, and cultural contributions. Beneficial EQ contributions are made by preserving, maintaining, restoring, or enhancing the significant cultural and natural environmental attributes of the study area. Developing an EQ Plan involves combining study specific measures together which best address the EQ objectives developed for the study, while, if possible, meeting other study objectives. EQ Plans should not have adverse impacts which override their positive preservation and enhancement features. This means that candidate EQ Plans must make net positive contributions to the components of the EQ account.

In some studies, it may be impossible to develop a plan that meets the minimum requirements for designating an EQ Plan; i.e., a plan that makes net positive contributions to the EQ account. In those cases, the plan which is least damaging to the environment will be identified. The Lorain Harbor Commercial Navigation Study is such a case.

Due to the commercial and industrial nature of the study area, combined with poor water quality, sediment contamination, and deep water depths, there is little opportunity to develop EQ objectives, with the exception of preserving existing natural areas (wetlands) within the study area, which would lead to an EQ Plan. Therefore, the least environmentally damaging plan has been identified for this study.

Alternative 9 calls for Outer Harbor improvements, reorienting the entrance, and renovating and modifying the abandoned coal slip at the lakefront. Alternative 9A includes Outer Harbor improvements, reorienting the entrance, and the addition of the Riverside Park Cut and a bulkheaded cut upstream of the Erie Avenue Bridge. Both of these alternatives use a conveyor system to transport material upriver. Alternative 10 includes the same features as Alternative 9, except a section of the riverbank upstream of the Erie Avenue Bridge would be bulkheaded. Alternative 10A would be the same as Alternative 9A. However, both Alternatives 10 and 10A would use a special purpose vessel to transport material upriver. Alternative 18 includes the same features as Alternative 9 with the exception of renovating the coal slip, which is not necessary under Alternative 18, and also includes three bank cuts on the Black River. Alternative 18A is similar to Alternative 18 with the addition of the cut through Riverside Park and a bank cut upstream of the Erie Avenue Bridge. Both Alternatives 18 and 18A allow direct delivery to the U. S. Steel facility by 767-foot vessels as well as allow 1,000-foot vessels to dock at the lakefront.

As can be seen from the above plan descriptions, Alternative 9 is the only plan that does not include any upriver bank cuts or bulkheading, thus causing the least disruption to the natural environment. Even though this plan does call for a land-based conveyor system, this does not appear to outweigh disrupting potential riverbank habitat. Many of the fish species persisting in the Inner and Outer Harbor in spite of adverse conditions, are dependent on the remaining shallow water areas and the limited cover provided therein. Shallow water habitat is scarce in the Inner Harbor, limited to the narrow band bordering the navigation channel between the river mouth and the Upper Turning Basin. Therefore, Alternative 9 (Lakefront Transshipment-Conveyor Upriver) has been designated the Least Environmentally Damaging Plan.

REMAINING CANDIDATE PLANS FOR THE TENTATIVELY SELECTED PLAN

The six structural plans considered in detailed planning involve two different concepts in the upriver movement of material. Alternatives 9, 9A, 10, and 10A involve the concept of transshipment from the lakefront (Alternative 9 and 10) or near Erie Avenue Bridge (Alternative 9A and 10A) to upriver users. Alternatives 18 and 18A consider the concept of direct delivery upriver in Class VIII vessels.

Of these six plans, three would involve the construction of the Riverside Park Cut feature (Alternatives 9A, 10A, and 18A). As presented in the Assessment and Evaluation of Detailed Plans section of this report, even though these overall plans exhibit economic feasibility (B/C ratios greater than 1.0), the Park Cut feature of the plans is not incrementally justified. For this reason Alternatives 9A, 10A, and 18A cannot be considered as the Selected Plan.

Evaluating the three remaining plans (Alternatives 9, 10, and 18) Alternative 9 is the NED Plan with net benefits of $5,390,000 (Table 62) compared to net benefits of $4,016,000 and $2,922,000 for Alternatives 10 and 18, respectively. Alternative 9 is also the Least Environmentally Damaging plan because it disrupts the least amount of existing habitat. On this basis, it appears that Alternative 9 should be the tentatively Selected Plan. However, prior to recommending this plan as the tentatively Selected Plan, some discussion regarding the potential for implementing this plan and potential local support for the plan is required.

At this time, the Local Sponsor and other affected local interests have not yet had the opportunity to review the findings presented in this report. This is especially true regarding the evaluation and assessment of Alternative 18, which was not developed until late in the Final Feasibility Study. However, the District has had recent contact with the Lorain Port Authority to get their preliminary opinions regarding the alternatives under consideration. The preliminary conclusion from these discussions is that even though the Lorain Port Authority is the designated local sponsor, the non-Federal cost will probably be borne by the project beneficiaries (i.e., U. S. Steel). Also, based on a cursory review of the plans, it appears doubtful that non-Federal interests would support either of the transshipment alternatives (Alternatives 9 and 10). Apparent reasons for this lack of support are twofold. First, in light of the current decline within the

domestic steel industry, financial participation in a transshipment plan does not appear likely. Also, the major upriver user, U.S. Steel, has most recently (17 August 1981 letter) stated that for the foreseeable future, it does not intend to utilize 1,000-foot vessels in its upriver trade, but will use direct delivery in 767-foot vessels. Several of these vessels have been converted from bulk freighters to self-unloading vessels to increase the efficiency of operations.

These preliminary discussions have indicated that potential local support does exist for Alternative 18. This alternative, if implemented, has the capability of meeting both the present and the long-term navigation requirements of lakefront users (use of 1,000-foot vessels in the Outer Harbor) due to the fact it contains all of the Outer Harbor modifications included within all of the transshipment alternatives evaluated earlier. This plan also meets the present navigation needs of upriver users by providing for more efficient upriver navigation by 767-foot vessels. In addition, this alternative does not preclude the future construction of transshipment options should, sometime in the future, the fleet involved in upriver trade change to the use of 1,000-foot vessels.

It should be noted that Alternative 18, with a total investment cost of $27.5 million, is the least costly of the six plans under consideration. In addition, this plan produces the highest Benefit/Cost (B/C) Ratio of 2.1 compared to a B/C of 1.7 and 1.5 for Alternatives 9 and 10, respectively. While not producing the maximum net benefits, this plan does have substantial net benefits amounting to $2.9 million.

From the environmental standpoint, although Alternative 18 does disrupt some aquatic habitat and eliminates some terrestial habitat (Bend Cut B), these adverse impacts are not considered sufficient to preclude implementation of this plan.

In determining the tentatively Selected Plan, the maximization of net benefits and the determination of environmental effects are critical factors. However, the District considers that these factors should not be the sole selection criteria if the Selected Plan using only these criteria would not have adequate local support and would not be implemented. This is especially true if other plans were evaluated which have substantial net benefits and have only moderately more adverse environmental impacts, but which have a much greater potential for implementation because they satisfy the primary commercial navigation needs, (i.e., (1) provide improvements at the Harbor Entrance and in the Outer Harbor for safer and more efficient operation of 1,000-foot vessels servicing Republic's transshipment facility; and (2) provide improvements to the Black River channel to allow loading of U.S. Steel's 767-foot vessels to the system draft of 25.5 feet at LWD) at a considerable savings in investment costs. Such would be the case for Alternative 18.

RATIONALE FOR TENTATIVELY SELECTED PLAN

Based on recent input from U.S. Steel and other local interests that the 767-foot vessel will be the maximum size vessel serving upriver users for

the foreseeable future, it is questionable as to whether Alternative 9 (also Alternative 10) should have been carried forward into the Final Feasibility stage as a "candidate plan" because it may not be consistent with the "most probable future" at Lorain Harbor. Conversely, Alternative 18 does appear to satisfy the "most probable" future commercial navigation needs (except for the launching and drydocking of 1,000-foot vessels at AmShip which is not incrementally justified and, therefore, not implementable) at Lorain Harbor, and does appear to have local support. For these reasons, Alternative 18 (Direct Delivery to U.S. Steel in 767-foot vessels - Upriver Bend Cuts) is the tentatively Selected Plan.

FISH AND WILDLIFE RESOURCE CONSIDERATIONS

It is general Corps of Engineers policy, consistent with the Fish and Wildlife Coordination Act (FWCA, PL 85-624) to give equal consideration to fish and wildlife resources throughout the course of a water resources development study. Fish and wildlife conservation (preservation, enhancement, and mitigation) are given equal consideration with other project purposes during project planning. Adverse impacts to significant fish and wildlife resources should be avoided or minimized, mitigated for to the extent justified, or enhanced to the extent justified and practicable. When fish and wildlife resource enhancement and/or mitigation is justified and recommended, it should be, if possible, in-kind and as near as practicable to where the losses occur.

Throughout the course of the Lorain Harbor Commercial Navigation study, close coordination was maintained with the U. S. Fish and Wildlife Service (USF&WS) and the Ohio Department of Natural Resources. Consistent with the FWCA, the USF&WS provided an Intermediate Coordination Act Report on the numerous alternatives considered and on the fish and wildlife resources of the study area. Several preliminary possibilities for fish and wildlife resource enhancement/mitigation, such as shallow water habitat improvement wetland protection/enhancement were presented, riparian habitat protection were suggested. These were considered by the Buffalo District during the course of preliminary planning, but no specific fish and wildlife mitigation/enhancement measures were developed as the relative significance of impact on the resources did not appear major.

The USF&WS provided a Draft Coordination Act Report, dated 7 March 1983 (Appendix F) during the preparation of this Draft FFR, after the number of alternatives had been reduced to two (Plans 9 and 18). This report addressed the fish and wildlife resources affected by the plans and suggested possible mitigation (compensation) measures that would involve construction of a rubble reef, 5 to 10 acres in size, to the west of Lorain Harbor to offset dredging and breakwater removal impacts. To offset impacts associated with upriver bend cuts, the USF&WS suggested anchoring large cut trees along the shoreline to offset losses to terrestrial habitat.

At the time of preparation of this Draft FFR, the Buffalo District has not incorporated any specific fish and wildlife resource enhancement/compensation measures as part of the preferred alternatives as it has not been proven that any major impacts will occur to significant fish and wildlife resources.

Appendix I presents the current Buffalo District conclusions on the need for fish and wildlife mitigation/enhancement as part of the Lorain Harbor commercial navigation study. At the present time, the Buffalo District has not recommended any mitigation/enhancement for the preferred plans as it has not been proven that any major impacts will occur to any significant fish and wildlife resources (see Appendix I).

CONCLUSIONS

GENERAL

Lorain Harbor, Ohio, is located on the south shore of Lake Erie, at the mouth of the Black River, approximately 25 miles west of Cleveland, Ohio, and 90 miles east of Toledo, Ohio. The harbor includes a breakwater protected Outer Harbor and improved navigation channels on the Black River.

The present configuration of the breakwaters and navigation channels, however, limit the effective utilization of the vessels which transport bulk commodities into Lorain. Significant transportation savings could be realized if the harbor were modified to permit the more efficient use of these vessels. The primary objective of this volume of the Lorain Harbor study is to develop a plan which provides for more efficient and economical movement of bulk cargos through the harbor. As possible solutions to these needs, six structural alternatives were developed in detail in this study in addition to the "No-Action" Plan.

An assessment and evaluation of these six detailed plans in terms of meeting the planning objectives, indicated the three alternatives involving construction of the Riverside Park Cut (Alternatives 9A, 10A, and 18A) should be eliminated from further consideration due to a lack of incremental economic feasibility. The three remaining structural plans (Alternatives 9, 10, and 18) and the "No-Action Plan warranted consideration as the Tentatively Selected Plan.

Based on the results of this Final Feasibility Study, it has been determined that Alternative 18 (Direct Delivery to U.S. Steel in 767-foot Vessels - Upriver Bend Cuts) is economically justified and environmentally viable and is the only plan considered in detailed planning which meets the "most probable" future fleet mix at Lorain Harbor. Of the three structural plans warranting consideration (Alternatives 9, 10, and 18), Alternative 18 is the plan which has the highest potential for implementation by local interests and is tentatively recommended for construction. However, considering the large monetary contribution required by local interests for the plans considered, their comments will be given serious consideration before the final decision is made.

FUTURE ACTIONS

Environmental - The Clean Water Act of 1977 requires that evaluation of the effects of the deposition of dredged or fill materials into the waters of the United States be accomplished. This evaluation including consideration of the Section 404(b)(1) Guidelines has not beeh completed, and therefore,

the DEIS does not include the information required by Section 404(r) of the Act. Prior to completion of the Final EIS, a Section 404 Public Notice and Evaluation will be prepared and coordinated with various Federal, State, and local agencies, and the general public. The results of this coordination will be presented in the Final Feasibility Report and EIS.

Fish and Wildlife Enhancement/Mitigation - As discussed in the previous section of this report, a final conclusion has not been reached on the need for fish and wildlife resource enhancement/mitigation (compensation). Further coordination will be done with the USF&WS and ODNR to determine if enhancement/mitigation is justified. The results of this coordination and determinations will be included in the FFR.

Model Study - The wave analysis performed for this study indicates that there may be increased wave activity in the Outer Harbor and at the lakefront under certain conditions if the outer 600 feet of the East Breakwater is removed. Assuming that one of the structural plans is recommened for implementation, the District will also recommend that a model study be performed at the Waterways Experiment Station during the preconstruction phase of this project. The purpose of model study will be to quantify the change in harbor wave conditions with the proposed entrance improvements, and identify needed modifications to the basic improvements to eliminate undesirable wave conditions, as appropriate. Also, a scale model of a 1,000-foot long vessel will be operated through the proposed Outer Harbor for breakwater alignment to verify that this realignment provides a safer entrance condition under design storm conditions.

RECOMMENDATIONS

After consideration of environmental, social, and economic effects as well as engineering feasibility, I have concluded that the best plan for accomplishing the plan objectives is Alternative 18. I, therefore, recommend that the tentatively Selected Plan, Alternative 18, with such modifications thereof as in the discretion of the Chief of Engineers may be advisable, be authorized for implementation as a Federal project subject to cost-sharing and financing arrangements, with the responsible non-Federal agency sponsoring the project, which are satisfactory to the President and to Congress. The first cost of this Alternative is currently estimated at $27,486,000 (December 1981 price levels) consisting of $26,070,000 Federal cost and $1,416,000 non-Federal cost. This recommendation is made provided that prior to construciton, non-Federal interests furnish assurances satisfactory to the Secretary of the Army that they will:

a. Provide without cost to the United States, all lands, easements, and rights-of-way necessary for construction and subsequent maintenance of the harbor improvements and for aids to navigation upon the request of the Chief of Engineers;

b. Hold and save the United States free from damages due to the construction and maintenance of the project except for damages due to the fault or negligence of the Government or its Contractors;

c. Provide and maintain without cost to the United States depths in the berthing areas and local access channels commensurate with depths provided in the related Federal project channel;

d. Accomplish without cost of the United States all utility and other relocations or alterations made necessary by the project;

e. Comply with the applicable provisions of the uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, approved 2 January 1971, in acquiring lands, easements and rights-of-way for construction and subsequent maintenance of the project, and inform affected persons of pertinent benefits, policies, and procedures in connection with said Act;

f. Contribute annually, until such time as multiple use of the widened river channel occurs, 50 percent of the annual charges for interest and amortization of the Federal first cost of the improvement, exclusive of O&M and aids to navigation, estimated at $365,000 per year (December 1981 price levels).

ROBERT R. HARDIMAN
Colonel, Corps of Engineers
District Engineer

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

Commercial Navigation Study at Lorain Harbor Lorain County, Ohio

The responsible lead agency is the U. S. Army Engineer District, Buffalo. The responsible cooperating agency is the Lorain Port Authority.

Abstract: Lorain, Ohio, is located on the southern shore of Lake Erie, approximately 25 miles west of Cleveland and [illegible] miles east of Toledo. The Buffalo District has investigated public concerns of the Lorain Harbor Study area related to harbor modifications for commercial navigation. Of the 21 plans initially considered, including the No Action Plan, [illegible] alternatives, in addition to No Action, were selected for detailed study. Alternative [illegible] would include a lakefront transshipment facility for 1,000-foot vessels with a conveyor system upriver from the Erie Avenue Bridge. Alternative [illegible] would be essentially the same, but with a channel and [illegible] to allow delivery of the transshipment facility located upstream of the Erie Avenue Bridge. Alternative 10 would include a lakefront transshipment facility for 1,000-foot vessels with special purpose vessels to transport material upriver from the Erie Avenue Bridge. Alternative 10A would be essentially the same, but with a channel and [illegible]. Alternative 18, which involves [illegible], would provide for direct delivery to the U.S. Steel plant [illegible] to accommodate 1,000-foot vessels in the outer harbor. Alternative 18A would be essentially the same, but with the channel [illegible]. Alternative 18 has been tentatively selected based on its effectiveness in addressing the identified public concerns and its net positive contributions to the goals of National Economic Development and to the objectives of environmental and social [illegible] considerations.

Send your comments to the District Engineer by: [illegible]

[illegible]

[illegible]

SUMMARY

MAJOR CONCLUSIONS AND FINDINGS

As a first task in the planning process, problems in a study area are identified by eliciting information from the public about water and related land resources management needs. The needs identified for Lorain Harbor include harbor modifications for commercial navigation to allow larger ships to utilize the harbor area and service area industry, additional marina facilities to serve recreational navigation demand, and reduction of sedimentation in the Black River, and thus reduction in harbor maintenance dredging and improved water quality. The thrust of this EIS is directed towards the investigation of commercial navigation needs at Lorain Harbor. Recreational navigation and sedimentation are addressed in separate reports.

As mandated by the Corps planning process, various alternative plans have been formulated to address area needs and planning objectives. These plans have been addressed and evaluated for social, economic, and environmental impacts. During preliminary planning, 17 alternatives, including the No-Action Plan, were analyzed. The plans were refined and two Alternatives -9 and 10 - capable of providing for 1,000-foot vessels to utilize the harbor, in addition to the No-Action Alternative, were recommended for further study. It was also recommended that two new alternatives that were similar to Alternatives 9 and 10, [illegible] be considered in the final feasibility stage. During this stage, [illegible] new alternatives were formulated as Alternatives [illegible]. [illegible] alternatives, Alternatives [illegible], providing for [illegible], direct delivery of [illegible] by 767-foot vessels, and the [illegible] 1,000-foot vessels to the Outer Harbor were also developed.

A study was also undertaken in order to establish disposal sites for the dredged and excavated materials resulting from construction of any of the alternative plans. Nine sites for [illegible] were evaluated using economic, environmental, and engineering criteria. Based upon this evaluation, the [illegible] (Site [illegible] Modified) was selected. [illegible] sidered as disposal [illegible] material. The [illegible] feasible disposal site. [illegible] sal of unpolluted, [illegible] which would be [illegible] bend widening and/or [illegible] site was considered [illegible] this excavated [illegible] information on the [illegible]

In selecting the [illegible] must not only satisfy [illegible]

Recognizing that Environmental Quality (EQ) has both natural and human manifestations, the EQ Plan addresses the planning objectives in a way which emphasizes aesthetic, ecological, and cultural contributions. Beneficial EQ contributions are made by preserving, maintaining, restoring, or enhancing the significant cultural and natural environmental attributes of the study area. Developing an EQ Plan involves combining study specific measures which best address the EQ objectives developed for the study, while if possible, meeting other study objectives. EQ plans should not have adverse impacts which override their positive preservation and enhancement features. This means that candidate EQ plans must make net positive contributions to the components of the EQ account.

In some studies, it may be impossible to develop a plan that meets the minimum requirements for designating an EQ Plan, i.e., a plan that makes net positive contributions to the EQ account. In these cases, the plan which is least damaging to the environment will be identified. The Lorain Harbor Commercial Navigation Study is such a case.

Due to the commercial and industrial nature of the study area combined with poor water quality, sediment contamination and deep water depths, there is little opportunity to fulfill EQ objectives (with the exception of preserving existing natural areas (e.g. Flat Stream wetland) within the study area) which would lead to an EQ Plan. Therefore, the Least Environmentally Damaging (LED) Plan has been identified for this study.

All six Alternatives (9, 9A, 10, 10A, 18, and 18A) include deepening the Outer Harbor and [illegible] the [illegible]. Alternative 9 includes Outer Harbor improvements, [illegible] [illegible] the abandoned coal slip at the [illegible]. Alternative [illegible] Harbor improvements, [illegible] the Riverside Park Cut and a [illegible]. Each of these alternatives [illegible] upriver. Both Alternatives 10 and [illegible] transport material [illegible] Alternative 9, [illegible]

[illegible]

Inner Harbor, limited to the narrow band bordering the navigation channel between the river mouth and the Upper Turning Basin. Therefore, Alternative 9 (Lakefront Transshipment-Conveyor Upriver) has been designated the LED Plan.

Of the six plans considered in detail, three would involve the construction of the Riverside Park Cut feature (Alternative 9a, 10A, and 18A). Even though these overall plans exhibited economic feasibility (B/C ratios greater than 1.0), the Park Cut feature of the plans was not incrementally justified. For this reason, Alternatives 9a, 10A, and 18A could not be considered as the tentatively Selected Plan.

Of the three remaining alternatives, non-Federal interests did not support either of the transshipment alternatives (Alternatives 9 and 10). The apparent reasons for the lack of support are twofold. The foremost reason being the high non-Federal expense which would be incurred by the construction of these plans ($52.2 million for Alternatives 9 and $68.4 million for Alternative 10). In light of the current decline within the domestic steel industry, financial participation by the primary beneficiary (U. S. Steel) in a transshipment plan would not seem likely. Secondly, U. S. Steel has stated that for the foreseeable future, it does not intend to utilize 1,000-foot vessels in its upriver trade, but will use direct delivery in 767-foot vessels.

Alternative 18, with a total investment cost of $27.5 million, is the least costly of the six plans under consideration. In addition, this plan would produce the highest benefit-cost ratio (4.6 compared to 2.5 and 1.8 for Alternatives 9 and 10, respectively). While not producing the maximum net benefits, this plan would have substantial net benefits totaling $9.1 million. From an environmental standpoint, although Alternative 18 does disrupt aquatic habitat and eliminate terrestrial habitat (Bend Cuts B, C, and D), these adverse impacts are not considered sufficient to preclude implementation of this plan. Therefore, Alternative 18 has been designated the Tentatively Selected Plan.

In regard to Executive Order (EO) 11990, Protection of Wetlands, none of the proposed alternatives would have any direct effect on any wetlands in the project area; therefore, this EO is complied with for the Lorain Harbor Commercial Navigation Study. The general objective of EO 11988, Flood Plain Management, is to avoid, to the maximum extent possible, long and short-term adverse impacts associated with the occupation and modification of the base flood plain whenever there is a practicable alternative to such an action. The Corps has concluded that there is no practicable alternative to the proposed action, which would occur within the 100-year flood plain of Lake Erie and the Black River, therefore, the recommended action is in compliance with EO 11988, Flood Plain Management.

The Clean Water Act of 1977 requires that evaluation of the effects of the deposition of dredged or fill material into the waters of the United States be accomplished. [illegible]

to completion of the Final EIS, a Section 404 Public Notice and Evaluation will be prepared and coordinated with various Federal, State, and local agencies, and the general public. The results of this coordination will be presented in the Final Feasibility Report and EIS.

Under Section 404(r) of the Clean Water Act, the requirement to obtain a State water quality certificate is waived since the 404(b)(1) Evaluation would be done as part of the feasibility study. Information on the effects of the discharge of dredged or fill material into waters of the United States, including the application of the Section 404(b)(1) Guidelines, would be included in the Final EIS on the proposed project. The EIS would be submitted to Congress prior to the actual discharge and before Congress authorizes the proposed project or appropriates funds for construction.

AREAS OF CONTROVERSY

In a letter dated 13 May 1981, John Sulpizio, Executive Director of the Lorain Port Authority requested that the Buffalo District analyse further the Riverside Park Cut since the vessel masters had shown strong support for it. However, since this project feature was not incrementally justified on an economic basis, it was eliminated from further consideration.

UNRESOLVED ISSUES

At the present time, the only major unresolved issue is the need for fish and wildlife resource enhancement/mitigation (compensation). The U. S. Fish and Wildlife Service (USF&WS) has recommended certain aquatic and terrestrial habitat compensation measures for the preferred plans. However, it has not been determined if the plans will have major impacts on significant fish and wildlife resources. The Buffalo District has not recommended any specific enhancement/mitigation at this stage of the study. Close coordination will be maintained with the USF&WS and ODNR during the review of the DEIS. The final positions fo the USF&WS and Corps of Engineers will be presented in the FEIS.

RELATIONSHIP TO ENVIRONMENTAL REQUIREMENTS

The detailed plans have been considered in relation to a number of Federal laws and policies as well as State laws, which have a bearing on the issues involved. Table EIS-1 presents a summary of environmental review and consultation requirements applicable to Corps Civil Works actions.

Table EIS-1 - Relationship of Plans to Environmental Protection Statutes and Other Environmental Requirements (Tentatively Selected Plan-Alternative 3G)

	Alternatives					
	3	3A	3C	3K	3E	3EA
FEDERAL STATUTES						
Archeological and Historic Preservation Act, as amended, 16 USC 469 et seq.	Full	Full	Full	Full	Full	Full
Clean Air Act, as amended, 42 USC 7401, et seq.	Full	Full	Full	Full	Full	Full
Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 USC 1251 et seq.	Full	Full	Full	Full	Full	Full
Coastal Zone Management Act, as amended, 16 USC 1451 et seq.	Full	Full	Full	Full	Full	Full
Endangered Species Act, as amended, 16 USC 1531 et seq.	Full	Full	Full	Full	Full	Full
Estuary Protection Act, 16 USC 1221 et seq.	N/A	N/A	N/A	N/A	N/A	N/A
Federal Water Project Recreation Act, as amended, 16 USC 460-1(12) et seq.	Full	Full	Full	Full	Full	Full
Fish and Wildlife Coordination Act, as amended, 16 USC 661 et seq.	Full	Full	Full	Full	Full	Full
Land and Water Conservation Fund Act, as amended, 16 USC 4601-4601-11 et seq.	Full	Full	Full	Full	Full	Full
Marine Protection, Research and Sanctuaries Act, 33 USC 1401 et seq.	N/A	N/A	N/A	N/A	N/A	N/A
National Historic Preservation Act, as amended, 16 USC 470 a et seq.	Full	Full	Full	Full	Full	Full

Table EIS-1 - Relationship of Plans to Environmental Protection Statutes and Other Environmental Requirements, Proposed Plan-Alternative [illegible]

National Environmental Policy Act, as amended, 42 USC 4321 et seq.	Full	Full	Full	Full	Full	Full
Rivers and Harbors Act, 33 USC 401 et seq.	Full	Full	Full	Full	Full	Full
Watershed Protection and Flood Prevention Act, 16 USC 1001 et seq.	N/A	N/A	N/A	N/A	N/A	N/A
Wild and Scenic Rivers Act, as amended 16 USC 1271 et seq.	N/A	N/A	N/A	N/A	N/A	N/A
EXECUTIVE ORDERS, MEMORANDA, ETC.						
Flood Plain Management (EO 11988)	Full	Full	Full	Full	Full	Full
Protection of Wetlands (EO 11990)	Full	Full	Full	Full	Full	Full
Environmental Effects Abroad of Major Federal Actions (EO 12114)	N/A	N/A	N/A	N/A	N/A	N/A
Analysis of Impacts on Prime and Unique Agricultural Lands in CEQ Memo	Full	Full	Full	Full	Full	Full
[illegible]						
[illegible]						
[illegible]						
[illegible]						

Table EIS-1 - [illegible] and [illegible] (Continued) [illegible] Plan/Alternative [illegible]

NOTES: 2. Partial Compliance - Some requirements of the statute, EO, or other policy and related regulations for the current stage of planning remain to be met.

3. Noncompliance - None of the requirements of the statute, EO, or other policy and related regulations have been met.

4. Not Applicable - N/A - Statute, EO, or other policy not applicable.

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

COMMERCIAL NAVIGATION STUDY
AT LORAIN HARBOR
LORAIN HARBOR, OH

TABLE OF CONTENTS

[redacted]
[redacted]

COMMERCIAL EXPLOITATION STUDY
AT LORAIN HARBOR
LORAIN HARBOR, OH

TABLE OF CONTENTS (Cont'd)

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

COMMERCIAL NAVIGATION STUDY
[illegible]
[illegible]

TABLE OF CONTENTS (Cont'd)

1. NEED FOR AND OBJECTIVES OF THE ACTION

1.1 Study Authority.

1.1.1 Recognizing the importance of [illegible] of the nation, the Committee on Public Works and Transportation of the House of Representatives on 13 September 197[illegible] adopted the following resolution:

> "Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the report on [illegible] Harbor, [illegible] published as House Document No. 16[illegible], [illegible] Congress, [illegible] and other pertinent reports with a view [illegible] tion to the [illegible] the present time, [illegible] safe navigation of [illegible] larger ships [illegible] Lakes."

1.1.2 This quoted resolution is the authority under which this Feasibility Report and Environmental Impact Statement was prepared.

1.2 Public Concerns.

1.2.1 Navigation Problems. [illegible] navigation [illegible] Study will primarily [illegible] navigation as related to the [illegible] [illegible] navigation. [illegible]

1.2.2 [illegible]

[illegible]

it encroaches into the Federal navigation channel. Docking of the Lorain-Cleveland shuttle vessel, at the most landward downstream of the Erie Avenue Bridge also creates some delays to other vessels on the river. The captains of vessels bound for the U.S. Steel facility believe that there is not enough channel width available for safe passage when a vessel is at the Republic Steel dock and have asked that the bridge tenders be asked to allow passage to upriver docks. This operating procedure was utilized for several months during the 1980 navigation season, but proved to be both time-consuming and costly to the affected vessels. On this basis, an analysis was performed to determine the economic viability of river modifications to eliminate this congestion point. The results of this analysis are presented in Appendix B of the Main Report.

1.2.4 U. S. Fish and Wildlife Service Concerns - The U. S. Fish and Wildlife Service (USFWS), in their Fish and Wildlife Coordination Act Report (Appendix E) published that there is a scarcity of suitable, shallow water habitat in the Outer Harbor area of Lorain. In addition, the lower 3 miles of the Inner Harbor, which comprises the natural channels on the Black River, are severely limited in biological productivity due to dredging, steep banks, and bulk-headed shorelines.

1.2.5 The Outer Harbor comprises an area of about 180 acres, of which about 80 acres is dredged to deep depths for commercial navigation purposes. About 70 acres on the east side and 30 acres on the west side of the Outer Harbor area remain undredged. The [illegible] dredging in the Outer Harbor area, [illegible] decrease the total amount of [illegible] and feeding areas. The [illegible] the possibility of providing [illegible] Outer Harbor where dredging [illegible] improvement is the placement [illegible] would not be dredged, but where [illegible] lacking. Rubblemound stone, placed [illegible] distance of the water surface [illegible] reef-like habitats, [illegible] port a high quality, [illegible]

1.2.6 Another [illegible] Inner Harbor area [illegible] this area much of the [illegible] narrow strips of [illegible] area. The only [illegible] acres in size, [illegible] Bridge. The [illegible] from any future [illegible] wetland for [illegible] tion [illegible] longer ships [illegible] [illegible] the [illegible] [illegible] [illegible] [illegible]

[illegible]

1.2.7 [illegible]

1.2.8 [illegible]

1.2.9 [illegible]

1.2.10 [illegible]

1.2.11 [illegible]

Lorain Harbor channels. This design criterion is based on the assumption that after 10 years, water treatment plants, [illegible], will bring the quality of bottom sediments to [illegible] and [illegible] of conservation measures will reduce the quantity and increase the quality of sediments within Federal channels to an acceptable level which will eventually permit the resumption of open-lake and/or shore area dumping.

1.2.12 The major source of sediment at Lorain Harbor is from either streambank or upland erosion. In evaluating the feasibility of reducing the amount of sediment entering the Federal project area, the predominant source(s) of the sediment must be identified. The results of this sedimentation and erosion study are presented as a separate volume of the Lorain Harbor Study.

1.3 Planning Objectives.

1.3.1 Development of the various alternative plans for commercial navigation improvements at Lorain Harbor considered the national objectives for planning water resource projects as set forth in the U. S. Water Resources Council's "Principles and Standards for Planning Water and Related Land Resources." These two national objectives are:

a. National Economic Development (NED) - National economic development is achieved by increasing the value of the nation's output of goods and services and improving economic efficiency. For the Lorain Harbor Commercial Navigation Project, the primary [illegible] with the NED account is from the transportation savings. According to the [illegible] Principles and Standards, the NED Plan is the alternative which [illegible] benefits.

b. Environmental Quality (EQ) - Environmental Quality is enhanced by the [illegible] improvement of the quality of certain natural and cultural resources and ecological systems.

1.3.2 Specific planning [illegible] State and local [illegible] problems [illegible] District [illegible] formulation of [illegible] Navigation Project.

1.3.3 [illegible] Harbor Study [illegible]

[illegible]

b. Protection and [illegible] of existing biological habitats along the lower reach of the Black River and the Outer Harbor [illegible]. These [illegible] include 100 acres of shallow water [illegible] in the Outer Harbor; unimproved shoreline along the Black River; wetland, about 15 acres in size, near the 21st Street Bridge; and undeveloped riparian areas upstream of the Upper Turning Basin.

2. ALTERNATIVES

2.1 Plans Eliminated From Further Study.

This discussion describes each plan considered in preliminary planning, but not included in the Stage 3 final array of alternatives, and the rationale for eliminating such plans. Plates referred to can be found in the Main Report.

2.1.1 Alternative 1 (Direct Delivery with Riverside Park Cut) - This alternative includes improvements for the entire [illegible] project area from the Outer Harbor to the Upper Turning Basin that would allow for passage of 1,000-foot vessels over the entire length of this area (See Plate [illegible]).

2.1.2 In the Outer Harbor, improvements would include removal of 600 feet of the East Breakwater and a 600-foot extension to the [illegible] Breakwater. A new Inner Harbor breakwater would be constructed to protect a proposed small-boat marina along the East [illegible]. The Outer Harbor would be dredged an additional 3 feet to allow larger vessels to [illegible] draft under heavy weather conditions.

2.1.3 A new channel 300 feet in width to accommodate 1,000-foot vessels would be constructed through Riverside Park. [illegible] of the entrance to the Black River would [illegible] the [illegible] of the existing [illegible]. In addition, cuts to widen the existing channel [illegible]. These channel cuts and Upper Turning Basin [illegible] maneuvering and [illegible].

2.1.4 [illegible]

2.1.5 [illegible]

2.1.6 [illegible]

structure that would allow passage of 1,000-foot vessels. The total length, which included approach fills and spans, and the length of the three-span structure, would be approximately 5,000 feet.

2.1.7 Alternative 2 was eliminated from further study because it would not be economically feasible (B/C less than 1). It also would require one of the largest outlays of both Federal and non-Federal funds and require significant land acquisition and disruptions to existing conditions.

2.1.8 Alternative 3 (Direct Delivery With New Movable Erie Avenue Bridge) - Instead of replacement of the Erie Avenue Bridge with a high level structure, a new, movable bridge at Erie Avenue would be constructed (see Plate 8). The new lift bridge would have a 370-foot clear span and a maximum height clearance of 125 feet for 1,000-foot vessels. All other construction items in this alternative are identical to Alternative 2.

2.1.9 Alternative 3 was eliminated from further study because it would be only marginally economically justified (B/C of 1.01). It also would require one of the largest outlays of both Federal and non-Federal funds and require significant land acquisition and disruption to existing conditions.

2.1.10 Alternative 4 (Direct Delivery With Tunnel Replacement of Erie Avenue Bridge) - The only difference between this alternative and Alternatives 2 and 3, is again the option of replacing the Erie Avenue Bridge, which would be replaced in this alternative by a tunnel under the Black River (See Plate 9). The tunnel would have four 13-foot wide traffic lanes, two 2-1/2-foot wide emergency sidewalks and a 6-foot wide pedestrian passageway. The total tunnel length would be approximately 3,000 feet, with 1,000 feet constructed under water.

2.1.11 Alternative 4 was eliminated from further study because it would not be economically feasible (B/C less than 1). It also would require one of the largest outlays of both Federal and non-Federal funds and require significant land acquisition and disruption to existing conditions.

2.1.12 Alternative 5 (Partial Transshipment with [illegible] Park Cut) - This alternative would [illegible] 1,000-foot vessels to the lower [illegible] transshipment conveyor facility [illegible] Harbor navigation [illegible] would be the same as in Alternative 1, [illegible] Riverside Park Cut would [illegible] Bridge. The [illegible] vide easier turning [illegible]

2.1.13 Alternative 5 [illegible] it would be economically [illegible] require significant [illegible] tion to existing [illegible]

2.1.14 [illegible]

for constructing a transshipment facility and conveyor at the 21st Street Bridge instead of enlarging the Upper Turning Basin and replacing the 21st Street Bridge (See Plate 11). Also included in this alternative are the same channel enlargement cuts, excluding the Riverside Park Cut, improvements to the Lower Turning Basin and transshipment conveyor facility as in Alternative 5.

2.1.15 Alternative 6 was eliminated from further study because although it would be economically justified, it would be significantly more expensive, require significantly more land acquisition, and cause much greater disruption to existing conditions than do Alternatives 9-16.

2.1.16 <u>Alternative 7 (Partial Transshipment With New Movable Erie Avenue Bridge)</u> - This alternative would be identical to Alternative 6 in all ways except that the Erie Avenue Bridge would be replaced with a movable bridge (See Plate 12). This bridge would have the same features as the new Erie Avenue Bridge described in Alternative 3.

2.1.17 Alternative 7 was eliminated from further study because although it would be economically justified, it would be significantly more expensive, require significantly more land acquisition, and cause much greater disruption to existing conditions than do Alternatives 9-16.

2.1.18 <u>Alternative 8 (Partial Transshipment With Tunnel Replacement of Erie Avenue Bridge)</u> - This alternative is identical to Alternatives 6 and 7 except that the Erie Avenue Bridge would be replaced with a tunnel under the Black River (See Plate 13). The tunnel would have the same features as the tunnel described in Alternative 4.

2.1.19 Alternative 8 was eliminated from further study because it would not be economically justified.

2.1.20 <u>Alternative 11 (Lakefront Transshipment - [illegible] Version)</u> - This alternative would improve harbor [illegible] conditions to permit safe and efficient operation of 1,000-foot vessels [illegible] and provide a transshipment facility for delivery of [illegible] by rail (See Plate 16). Lakefront navigation [illegible] the existing river channel [illegible] of the East Breakwater, and lengthening [illegible]. The rail car loading facility would be located [illegible] by a conveyor system from the [illegible] is existing trackage, the rail lines [illegible] to carry the anticipated loads.

2.1.21 Although Alternative 11 [illegible] concluded that the [illegible] final feasibility stage [illegible]

cial purpose vessel (Alternative 10). Therefore, Alternative 11 was eliminated from further study.

2.1.22 Alternative 12 (Lakefront Transshipment - Truck Upriver) - This alternative would be similar to Alternative 11 except instead of rail transshipment upriver, there would be construction of an upriver truck system to carry material as far as the U. S. Steel property (See Plate 17). From the transshipment facility, a conveyor system would direct the material flow to the truck-loading facility along the Black River. A roadway which parallels the river would be constructed from the truck loading facility upriver to U. S. Steel. A truck turn-around would be provided at each end.

2.1.23 Although Alternative 12 would be economically justified, it was concluded that the preferred transshipment modes would be conveyor and special purpose vessel. Therefore, Alternative 12 was eliminated from further study.

2.1.24 Alternative 13 (Lakefront Transshipment With Riverside Park Cut - Conveyor Upriver) - This alternative would improve harbor entrance conditions to permit safe and efficient operation of 1,000-foot vessels to the lakefront and provide a transshipment facility for delivery of iron ore to U. S. Steel by conveyor. A new channel would be constructed through Riverside Park (See Plate 18). The construction of the Riverside Park Cut would enable easy access to the An Ship facility by the larger vessels.

2.1.25 Alternative 13, with the exception of the Riverside Park Cut, is very similar to Alternative 9. The additional benefits attributable to the Riverside Park Cut would be less than the additional cost incurred. Since Alternative 9 would fulfill the planning objectives and has greater net benefits, Alternative 13 has been eliminated from further study.

2.1.26 Alternative 14 (Lakefront Transshipment With Riverside Park Cut - Vessel Upriver) - This alternative would improve harbor entrance conditions to permit safe and efficient operation of 1,000-foot vessels to the lakefront and provide a transshipment facility for delivery of iron ore to U. S. Steel by special purpose vessel. A new channel would be constructed through Riverside Park (See Plate 19). The construction of the Riverside Park Cut would enable easy access to the An Ship facility by the larger vessels.

2.1.27 Alternative 14, with the exception of the Riverside Park Cut, is very similar to Alternative 10. The additional benefits attributable to the Riverside Park Cut would be less than the additional cost incurred. Since Alternative 10 would fulfill the planning objectives and has greater net benefits, Alternative 14 has been eliminated from further study.

2.1.28 [illegible] - Rail Upriver - [illegible]

2.1.29 [illegible]

2.1.30 Alternative 16 ([illegible] - Truck Upriver) - This alternative [illegible] Alternative 12, with the addition of [illegible] to provide better access by 1,000-foot vessels [illegible] (see [illegible] 21). The additional benefits attributable [illegible] less than the additional cost incurred. [illegible] Alternative 12 [illegible] the planning objectives and has greater net benefits, Alternative 16 has been eliminated from further study.

2.1.31 Disposal Site Alternatives - In 1974, a study [illegible] sider nine sites as possible [illegible] polluted material resulting from the [illegible] for the proposed commercial navigation [illegible] of the Main Report discusses the [illegible] rationale behind the selection of the [illegible] Disposal Facility.

2.2 Without Conditions.

2.2.1 Alternative 17 - [illegible] Alternative for Lorain [illegible] bor configuration by vessels [illegible] existing program of [illegible] bor modifications [illegible] than 730 feet by 75 [illegible] transported in vessels [illegible] of 25.5 feet. For [illegible] lightloaded Class [illegible] vessel. As [illegible] required, [illegible] intensify. This [illegible] tation savings [illegible] implemented.

2.2.2 Water [illegible] improve in the future [illegible] into the river. [illegible] and other [illegible] increase due to the industrial [illegible] port.

2.3 [illegible]

This section [illegible]

[illegible]

lakefront transshipment facility capable of accommodating 1,000-foot vessels. The facility would be located in the coal slip just east of the East Pier. This alternative would improve harbor entrance conditions to permit safer and more efficient operation of 1,000-foot vessels to existing lakefront facilities and would provide a transshipment facility for delivery of iron ore to U. S. Steel by conveyor (See Plate 23).

2.3.2 Lakefront navigation improvements would include removal of 400 lineal feet of the East Breakwater and an equal lengthening of the shoreward end of the Outer Breakwater. These changes in the breakwater configuration would widen the entrance channel from 550 feet to 900 feet at its narrowest point. The lake approach channel would be deepened 3 feet, to a depth of 32 feet and the Outer Harbor turning basins would be expanded and deepened by an additional 3 feet. This alternative would use an inactive coal slip for the berthing area for the lakefront transshipment facility. This area of the Outer Harbor is sufficient to accommodate the transshipment facility for Alternative 9 and the Lakefront transshipment facility recently constructed by Republic Steel Corporation that serves its Cleveland and hinterland plants. The east side of the coal slip was selected as the wharf for the proposed off-loading facility and would require renovation and structural modifications to render it suitable for a docking facility. The coal slip area would also require dredging to enable berthing of 1,000-foot vessels.

2.3.3 For this alternative, a conveyor system would be used to transport the off-loaded iron ore upriver to the U. S. Steel Plant. The system would be fed by a dock hopper constructed on the East Pier which would receive the shipments and direct the material flow to a transshipment facility located immediately upstream of the Erie Avenue Bridge. [illegible] feet of enclosed conveyor construction would be [illegible] pellet storage piles and 30 lineal feet of [illegible] a below-grade rail crossing. From the transshipment facility, the conveyor system would meander upriver, pass beneath the [illegible] Street Bridge and terminate at U. S. Steel. Elevated structures would be required to bridge East Ninth Street and the [illegible] Railroad tracks. The conveyor would be enclosed for safety and [illegible]. Dust collection systems would be [illegible]. This alternative would also require [illegible] disposal area for disposal of [illegible].

2.3.4 Alternative 9 is the only plan that would not include any [illegible] cuts or bulkheading, [illegible]. Even though this plan would [illegible] system, its impacts would [illegible] tion of riverine [illegible] fish species [illegible] are dependent [illegible] therein, the [illegible] Alternative 9 [illegible]

2.3.5 [illegible]

benefits totalling $11,[illegible],000. [illegible] designated the [illegible] Plan.

2.3.6 [illegible] Cut - Conveyor [illegible] [illegible] except that it [illegible] the [illegible] feature of the [illegible] Cut [illegible] which would allow 1,[illegible] transshipment facility [illegible] Bridge. This plan would eliminate [illegible] and the conveyor from the [illegible] with Alternative [illegible] [illegible] tated by construction of [illegible] which would provide a [illegible] features of this plan [illegible]

2.3.7 [illegible] to the Outer and [illegible] 1,000-foot [illegible] would also require [illegible] from one from the [illegible] A 7-foot [illegible] would [illegible] area in order to [illegible]

2.3.8 [illegible] native and the [illegible] ment facility, [illegible] a depth of 28 feet [illegible] provide a new [illegible] located through Riverside [illegible] and about 800 feet long [illegible] the existing river [illegible] to the [illegible]

2.3.9 [illegible]

[illegible]

required to the existing [illegible] in order to [illegible] vessels and a hopper and [illegible] would have to be [illegible] to transport iron ore from the [illegible] to the [illegible] upstream of the Erie [illegible] at the transshipment [illegible].

2.3.11 This plan would also require construction of [illegible] around the existing [illegible] to provide [illegible] for containing polluted dredged material.

2.3.12 [illegible] Cut - Special [illegible] 10 except that this plan would [illegible] along side the transshipment [illegible] would eliminate the need to modify the [illegible] provide a conveyor system from [illegible] facility. This alternative [illegible] 1,000-foot vessels to [illegible] providing a [illegible] features of this plan are [illegible].

2.3.13 Construction features [illegible] 10 and 10A are detailed below. The [illegible] would be modified to [illegible] and the Outer Harbor would [illegible] require construction of the [illegible] vessel for the [illegible] the construction of a [illegible] ment of polluted [illegible].

2.3.14 [illegible] of the Riverside [illegible] depth of 2[illegible] feet [illegible] Riverside [illegible]

2.3.15 [illegible]

2.3.16 The construction items associated with this plan are described below and are shown on Plate 27. This plan would require modifications to the Outer Breakwater and East Breakwater to provide a [illegible] channel for 1,000-foot vessels that service [illegible]. Also [illegible] in the Outer Harbor Improvements is the need to dredge the Outer Harbor. The disposal of polluted dredged material would require construction of a 7-foot berm in the existing diked disposal area.

2.3.17 Three upriver bend cuts designated Cuts B, C, and D, would be provided in order to allow the [illegible]-foot vessels [illegible] for upriver trade to draft 1-foot deeper. Cut B is on the [illegible] upstream of the [illegible] Railroad Bridge and would provide approximately [illegible] of additional width at its widest point. Cut C is on the [illegible] of the 21st Street Bridge and would provide approximately [illegible] of additional channel width. Cut D, located on the [illegible] of the 21st Street Bridge, would widen the channel by approximately [illegible] feet.

2.3.18 Alternative [illegible] (Channel Delivery - [illegible] - Riverside Park Cut) - This plan is identical to [illegible] except that this plan contains the [illegible].

2.3.19 The additional construction [illegible] with this plan are as follows. The East [illegible] approach for the park cut. [illegible] Park Cut and sheetpile bulkheads [illegible]. A sheetpile cell river [illegible] divert river flows [illegible] immediately upstream of the [illegible] order to provide a [illegible]. These construction features are [illegible].

2.3.20 Disposal Sites - [illegible] polluted [illegible]

2.3.21 [illegible]

Table EIS-2 - Dredging and Excavation Quantities (cubic yards)

Alternative	Polluted (Diked Disposal)	Unpolluted: Soft Material (Open-Lake Disposal)	Unpolluted: Hard Material (Open-Lake Disposal)
9	300,000	760,000	–
9A	449,000	2,773,000	401,200
10	300,000	760,000	–
10A	449,000	2,773,000	401,200
18	300,000	1,652,400	–
18A	440,000	3,665,400	[illegible]

2.3.22 Alternative 17 (No-Action) - This plan would continue [illegible] movements within the current harbor configuration. It provides for the existing program of harbor maintenance, [illegible] further harbor modifications needed for safe and [illegible] vessels. This means bulk cargo [illegible] limited in size by the current [illegible] the Outer Harbor entrance, the [illegible] vessel, and for the Black River Channel, a [illegible] vessel. As [illegible] traffic increases [illegible] problems related to safe and [illegible]

2.4 Implementation Responsibilities

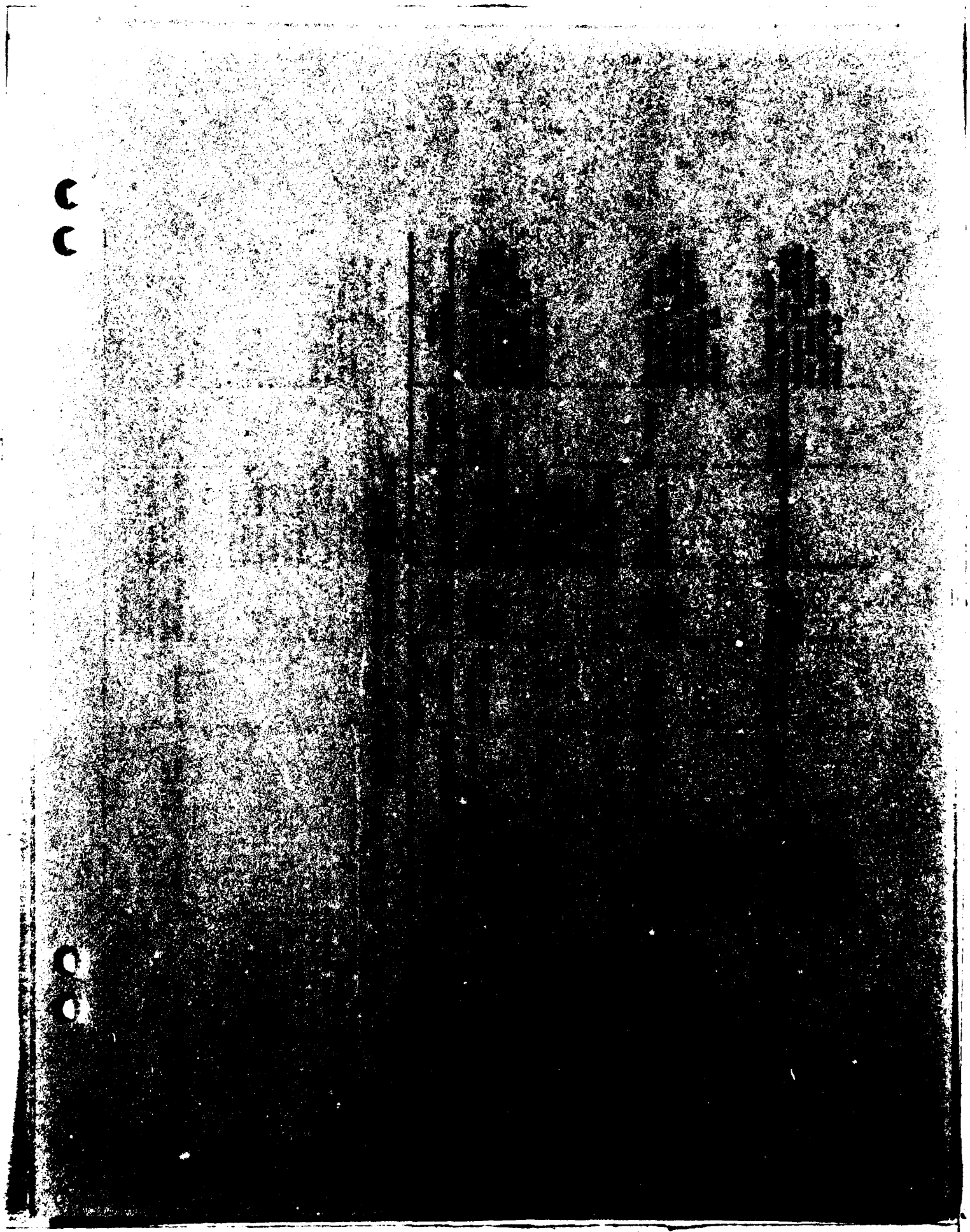
2.4.1 Federal - [illegible] providing the Federal share [illegible] out the initial [illegible] if a harbor modification [illegible] also provide [illegible] responsible for their [illegible]

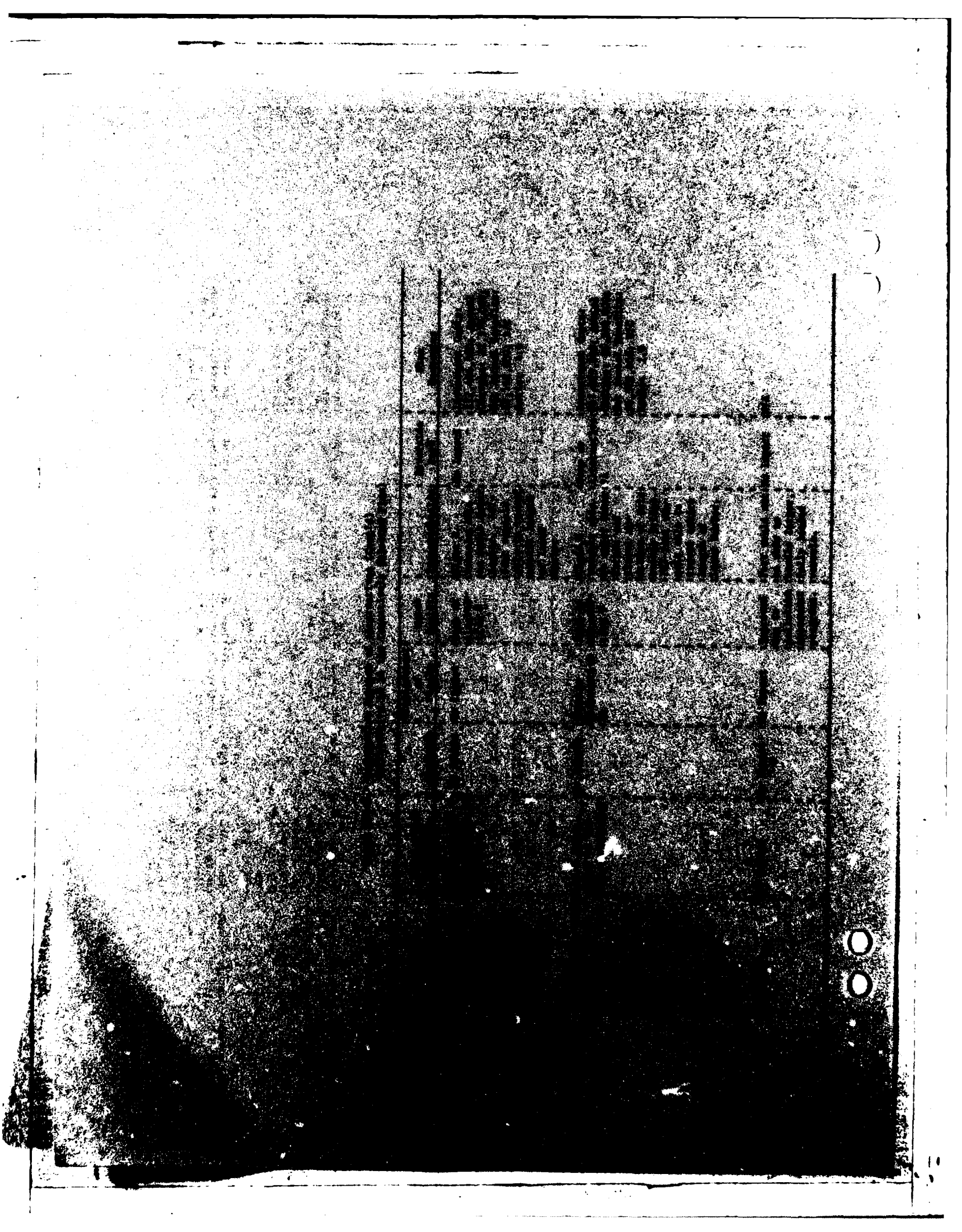
2.4.2 Local - [illegible] viding the [illegible] non-Federal share [illegible]

2.5 [illegible]

2.5.1 [illegible]

[redacted]





3. AFFECTED ENVIRONMENT

3.1 Environmental Conditions.

This discussion describes the major characteristics of the study area's natural and human resources to provide a general understanding of the physical, ecological, social, cultural, and economic conditions.

3.1.1 Lorain Harbor is located on the south shore of Lake Erie at the mouth of the Black River, approximately 25 miles west of Cleveland, OH, and 90 miles east of Toledo, OH. The harbor consists of a lake approach channel, an Outer Harbor, and a navigation channel in the Black River which serves as the Inner Harbor. The Outer Harbor consists of [illegible] about 180 acres protected by [illegible] consists of an improved navigation channel [illegible] miles up the Black River.

3.1.2 The banks of the Black River and the [illegible] the harbor are characterized by [illegible] transportation uses, [illegible] recreation use activities. [illegible] vacant or unused land available for [illegible] the 3 mile navigation channel.

3.1.3 Lorain Harbor is a deep draft [illegible] of Lorain which is [illegible] period (1966-1976) [illegible] annually, consisting principally of [illegible] harbor includes [illegible] owned by the city, is located between the city's [illegible] and the U.S. Coast Guard Station and [illegible] [illegible] is located [illegible] below the [illegible] [illegible] [illegible] Park, to the west [illegible]

3.1.4 [illegible] 1970 [illegible] [illegible] 13.3 [illegible]

[illegible]

gently-sloping shoreline is the wetland area immediately below and downstream of the 21st Street Bridge. Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Water Resources Policies and Authorities; Implementation of Executive Order 11990 - Protection of Wetlands 33 CFR 235.4(c)). This wetland is approximately 15 acres in size and is vegetatively dominated by broad leaved cattails and other emergent plants.

3.1.6 According to the USFWS, a moderately diverse fish community persists in Lorain Harbor in spite of rather limited physical habitat and degraded water quality. Within the last 10 years, 47 species of fish have been identified for the Outer Harbor. During the same period of time, 41 species of fish have been collected within the lower reaches of the Black River. Gizzard shad and emerald shiner dominate catches in both the Outer Harbor and the lower river area. Freshwater drum, smelt, white bass, spottail shiner, trout-perch, and yellow perch are also common in the Outer Harbor. Trout-perch are also very common in the lower river along with carp, brown bullhead, and white sucker. Spawning and nursery habitat for fish are almost nonexistent in the lower river area and in the Outer Harbor, the habitat is severely limited because of deep navigation channel depths.

3.1.7 Wildlife observed was concentrated in the 21st Street wetland and the river area upstream of the Upper Turning Basin. The persistent emergent cover in the wetland provides shelter for small mammals such as the eastern cottontail, shrews, mice, and voles. Muskrat and raccoon tracks were also observed.

3.1.8 Lorain Harbor is located on the eastern edge of the Mississippi flyway and on the western edge of the Atlantic flyway, thus attracting large numbers of ducks, geese and swans, which pass through the area on migratory flights between southern wintering grounds and northern breeding grounds. The Outer Harbor provides [illegible] for many species of diving ducks including [illegible]. The only [illegible] dabbling duck is the mallard. Herring gulls, [illegible] gulls, and Bonaparte's gulls are also [illegible] in the Outer Harbor. No significant amounts of waterfowl breeding occur in either the Outer Harbor or the lower reaches of the Black River.

3.1.9 The Lorain Harbor area was [illegible] of the USFWS and it was determined that [illegible] species [illegible]. However, the project [illegible] (Myotis sodalis) which is [illegible] Natural Heritage [illegible]), a [illegible] approximately 3,000 [illegible]

3.1.10 The Lorain Lighthouse, located on the West Breakwater, is currently listed in the National Register of Historic Places. This structure would not sustain any direct impact resulting from the implementation of any of the proposed alternatives. Based on a cultural resources report completed for the area in 1975 entitled: Inventory of Cultural Resources, Diked Disposal Site No. 7, Lorain Harbor, Ohio, by Dr. [illegible], and correspondence with the Ohio Historic Preservation Office, the Regional Archeological Preservation Office, and the National Park Service, no potentially significant sites would be impacted by any of the proposed alternatives.

3.2 Significant Resources.

This section describes each significant resource included in the Comparative Impacts of Alternatives Table (p. [illegible]-27), including its location, quantity, and quality. In further identifying and characterizing resources, consideration is also given to the following criteria for resource significance:

a. Resources identified in the laws, regulations, guidelines, or other institutional standards of national, regional, and local public agencies. Resources identified in the guidelines of certain private groups were also considered.

b. Resources meeting certain study-specific technical criteria for measuring characteristics that may be critical to resource evaluation. Technical criteria include, but are not limited to, [illegible] of resource scarcity, fragility, resiliency, representability, and tolerance.

c. Resources specifically identified as a concern by public interests.

d. Resources which, if affected by a plan would violate an institutional standard, meet a study-specific technical criterion, or become the subject of public concern.

3.2.1 [illegible]

narrow strips of shallow water habitat remain on either side of the commercial channel in this area. The river is bulkheaded with sheet steel from the mouth to the Erie Avenue Bridge, along the [illegible] property, and along the south side of the Upper Turning Basin. Most of the rest of the shoreline of the Inner Harbor consists of steep eroding banks with some outcroppings of shale. The only area with a rather gently sloping shoreline is the wetland area immediately below and downstream of the 21st Street Bridge.

3.2.3 Terrestrial Habitat - The majority of the banks along the Black River are of very limited wildlife value because of prior commercial development. However, the area that would become Cut B is presently wooded habitat and supports a number of small mammals and songbirds.

3.2.4 Wetlands - According to the [illegible], the only area with a rather gently sloping shoreline is the wetland area immediately below and downstream of the 21st Street Bridge, approximately 15 acres in size. On a field survey on 10 July 1979, approximately 50 percent of the wetland was covered with up to six inches of water and most of the rest of the [illegible] was saturated. Two storm sewers discharge into the wetland. One is located [illegible] of the bridge and its effluent flows to the [illegible] through the wetland. The other is located approximately 2/3 of the way from the bridge to the [illegible] end of the wetland and its flow is to the north. Along the [illegible] edge of the wetland were a number of large willow trees. Also along [illegible] and along the edges of the storm sewer discharge [illegible] bulrush, smartweeds, [illegible] and other [illegible] two areas that covered approximately 50 [illegible] area. Broad-leaved cattail was the dominant [illegible] approximately 75 percent of the [illegible] wetland was covered by a number of large [illegible] clumps of [illegible]. In all the [illegible] dense growth of filamentous green algae and a [illegible] (Lemna minor). Along the south edge of the wetland [illegible] field herbaceous species blended into the [illegible]. The vegetative species found in each area are [illegible] cover map of the wetland is included as [illegible] wetland dominated by broad-leaved [illegible] the 1975 survey done by the [illegible]. This change in vegetation [illegible] levels. The [illegible] the [illegible] field [illegible] summer high water [illegible]

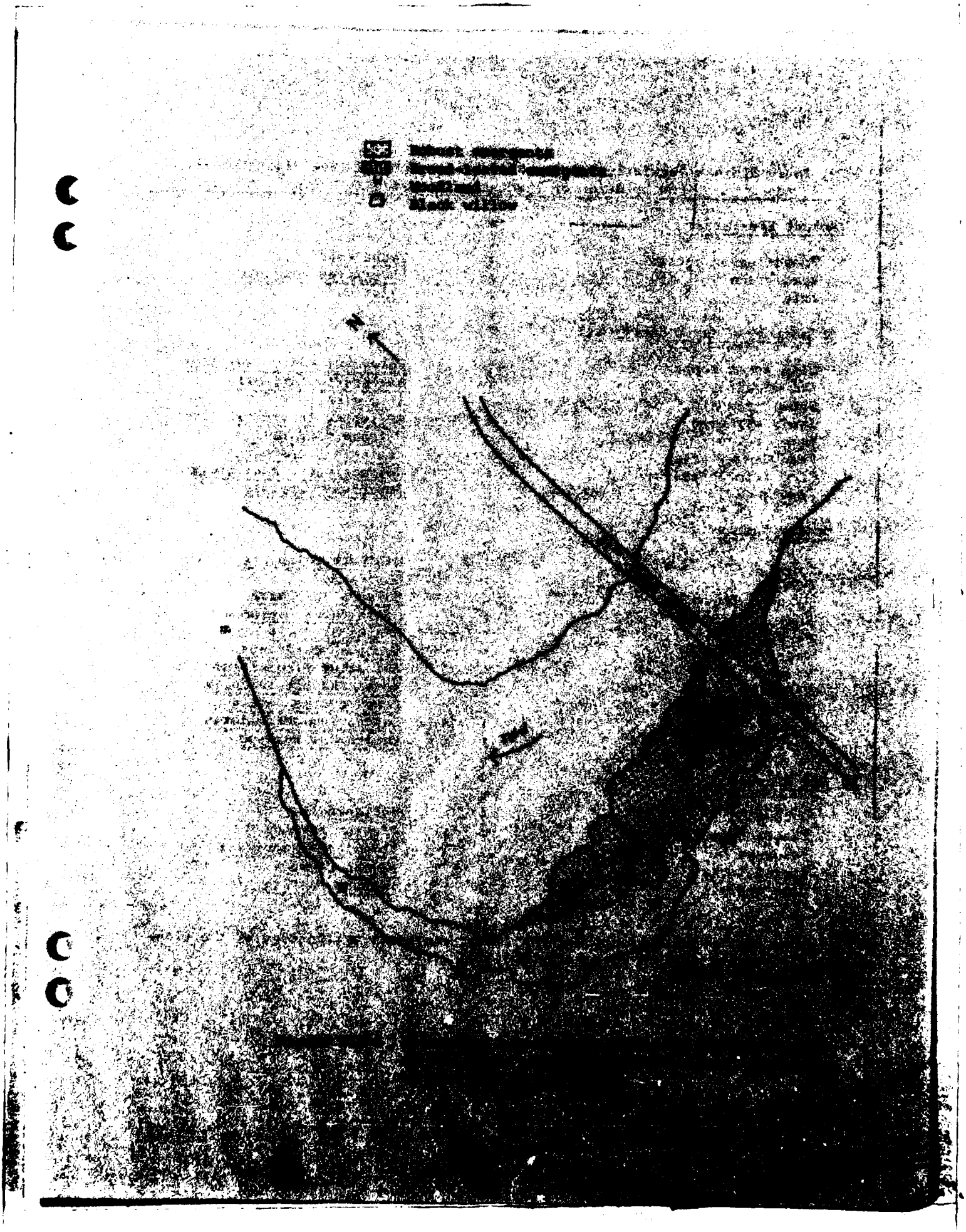


Table EIS-4 - Vegetation of the [illegible] (See Figure EIS-1 for location of [illegible])

Robust Emergents:

- Broad-leaved cattail
- Reed grass
- Iris

Broad-Leaved Marsh Emergents:

- Mild water pepper
- Arrowhead
- Water plantain
- Swamp milkweed
- River bulrush
- Reed Canary grass
- Blue joint grass
- Jewelweed

Meadow Emergents:

- Swamp rose mallow
- Nettle
- Nightshade
- Hedge bindweed
- Peppermint
- Water horehound
- Willow herb
- Wingstem
- Wild cucumber
- Sumac
- White snakeroot

Old Field:

- Goldenrod
- Canada thistle
- Pokeweed
- Beggar ticks
- Rose vervain

[illegible]

[redacted]

3.2.5 [illegible] - The [illegible] area is primarily [illegible].

3.2.6 Water Quality - The U. S. Environmental Protection Agency (EPA) conducted intensive water quality surveys in the Black River basin from 1974 to 1979. An intensive survey of the lower Black River was conducted on 16-19 July 1979 and included most of the sampling points employed in the 23-26 July 1974 intensive surveys. Since there were no significant differences in waste treatment at the Elyria Sewage Treatment Plant (STP), located 11 miles upstream, and U.S. Steel, the stream quality data obtained was quite similar to those obtained in 1974.

3.2.7 Major findings of the survey include:

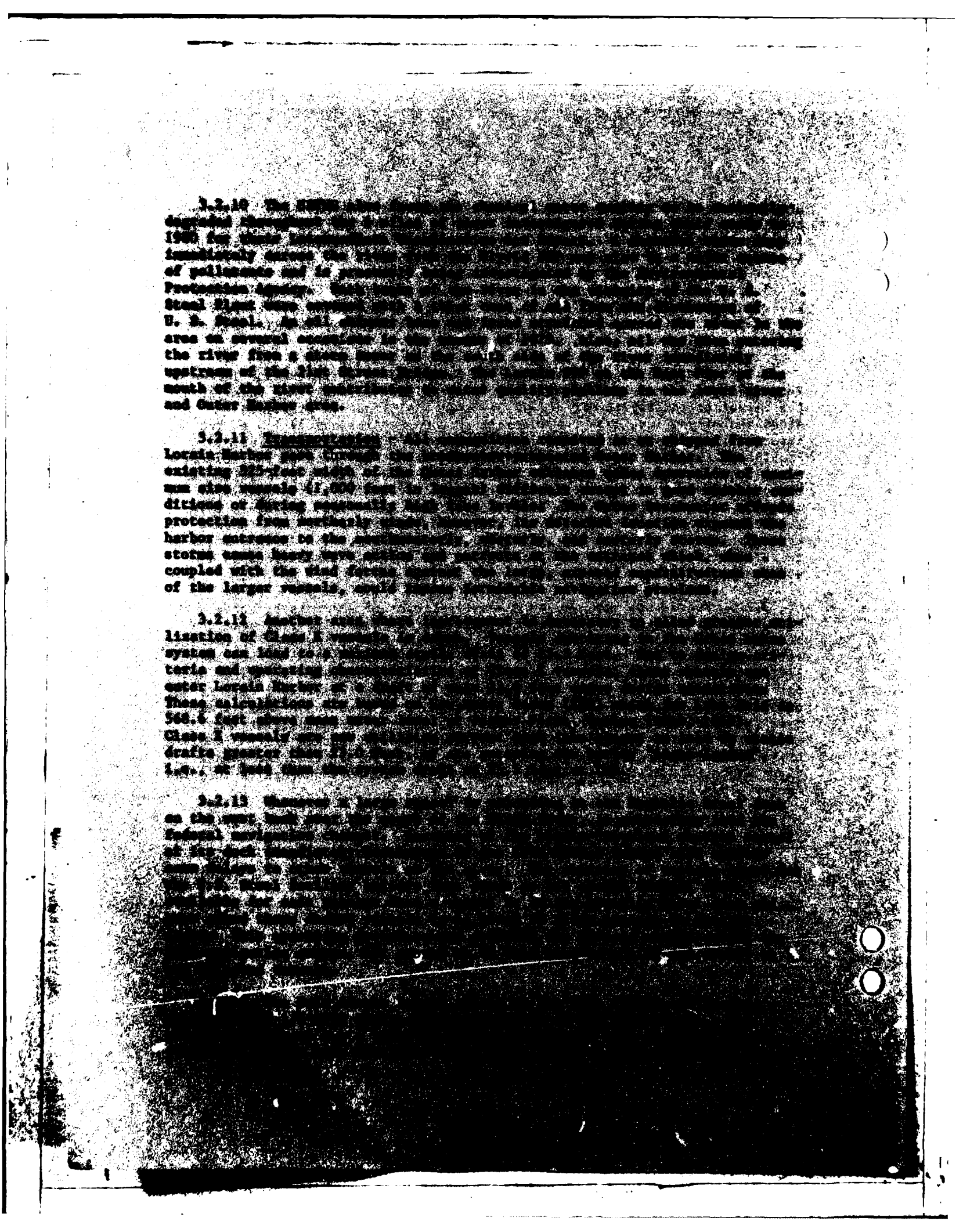
3.2.7.1 There were 189 known point-source dischargers within the Black River planning area, including 146 public and semi-public sewage treatment plants, 38 industrial facilities, and 5 water treatment plants. Four facilities discharged directly to Lake Erie, 177 discharged to streams with water quality design flows of zero cubic feet per second (cfs), and 8 discharged to lake-affected areas of the Black River or to streams having a nonzero water quality design flow.

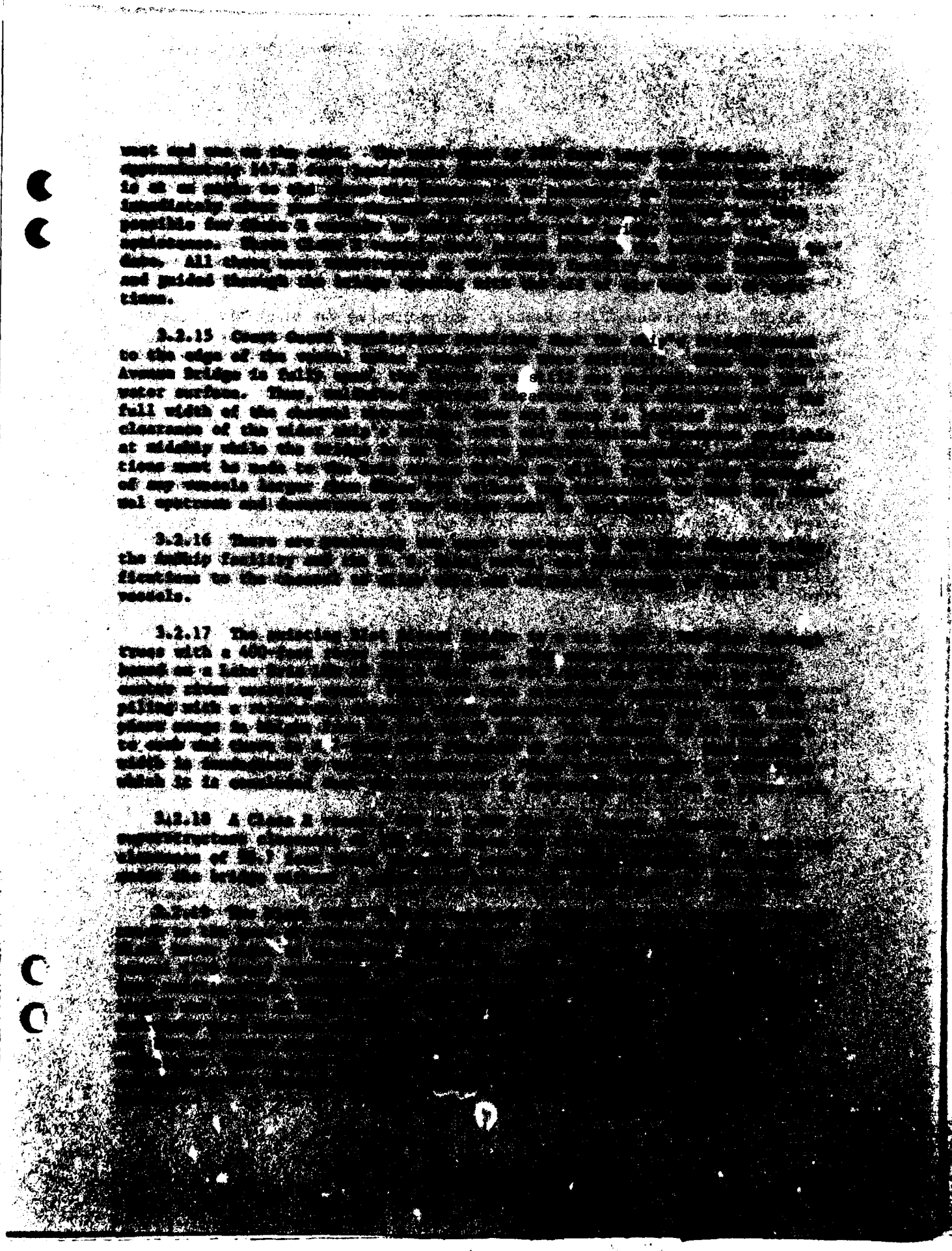
3.2.7.2 Upstream of Elyria, most streams had good quality water and were in substantial compliance with Ohio water quality standards. Violations of the cadmium and lead standards were found at several locations, apparently the result of agricultural nonpoint source pollution. Bacterial standards were exceeded throughout the basin due to the discharge of inadequately disinfected sanitary wastes.

3.2.7.3 Large discharges of ammonia and other oxygen-demanding materials from the Elyria sewage treatment plant were responsible for [illegible] violations of Ohio Water Quality Standards [illegible] in the main stem of the Black River. [illegible] Steel-Lorain Works [illegible] of the [illegible] River, and the [illegible] contribute to the [illegible] oil discharge from U.S. Steel [illegible] 3745-1-04 [illegible] discharge from the [illegible] dissolved copper [illegible]

3.2.7.4 [illegible]

[redacted]





3.2.20 Required channel [illegible]
width, a width for a [illegible]
additional widening for [illegible]
the vessel to maneuver [illegible]
width for both channeling [illegible]
ween the vessel and the [illegible]
design vessels with [illegible]
in the critical areas [illegible]

3.2.21 Erie Avenue [illegible]
Erie Avenue Bascule Bridge [illegible]
Lorain Chamber of Commerce, [illegible]
vessels to pass, in 1980, [illegible]
bridge is opened, entering or [illegible]
congestion.

3.2.22 Shipyards Reach - [illegible]
near the mouth of the Black River. [illegible]
Private residences are on the [illegible]
developed as industrial land. [illegible]
acres), it offers a small [illegible]
almost totally developed [illegible]
workers to spend their lunch [illegible]
activity in the river. [illegible]
stretch of the Black River.

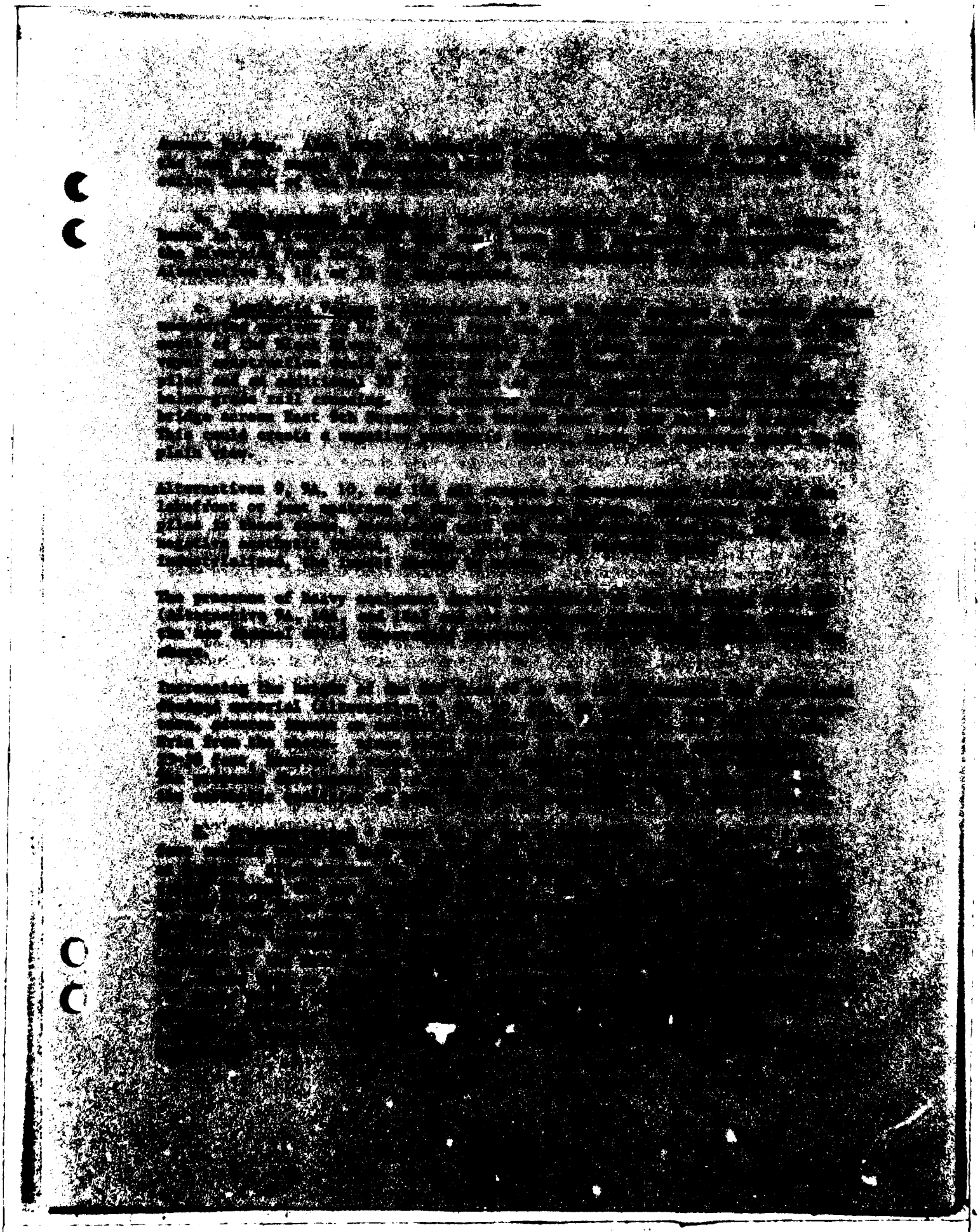
4. ENVIRONMENTAL IMPACTS

This chapter describes the [illegible]
described significant [illegible]
detailed analysis of the [illegible]
Alternatives Table (p. [illegible]
the environmental [illegible]
Selected Plan, and [illegible]

4.1 Alternatives [illegible]

4.1.1. Social Effects

a. Noise - The [illegible]



Alternatives 9 and 10 would [illegible] berthing area for the [illegible] would require [illegible] for a docking facility. [illegible] would also require dredging [illegible] included in Outer Harbor [illegible]. Also, vessel congestion at the mouth of the [illegible] Steel's vessels would no longer [illegible] at their Pellet Terminal. Alternatives [illegible] ment of material [illegible] to U.S. Steel [illegible]. Alternatives 18 and 18A would provide for [illegible] purpose vessel. [illegible] west of the special purpose [illegible] val of approximately 6,300 [illegible]. Alternatives 18 and 18A would provide for passage of 767-foot vessels the entire length of the Inner Harbor.

Alternatives 18 and 18A would not preclude the construction of transshipment options should the fleet involved in upriver trade change to the use of 1,000-foot vessels.

Alternatives 9 and 10 would help ease traffic congestion on Erie Avenue since the bridge would not have to open as often to allow vessels to pass. Class [illegible] vessels would instead unload at the [illegible] transshipment facility under these alternatives. According to the Lorain [illegible], there were 1,933 Erie Avenue Bridge openings in 1981.

e. Recreation Opportunities (Riverside Park). - Under Alternatives 9, 10A, and 18A, Riverside Park would be [illegible] for the new channel cut. Although this park is small (approximately [illegible] acres), the recreational opportunities that it does afford would be [illegible].

f. Community Cohesion - No impacts are expected.

g. Community and Regional Growth. - [illegible] alternatives, U. S. Steel [illegible] 1,000-foot ships [illegible] transporting raw materials [illegible] transshipment facility [illegible] cuts to allow 767-foot [illegible] Alternatives 18 and 18A [illegible] Alternatives 9, 10A, [illegible] facility, [illegible] other than U.S. Steel [illegible] limiting [illegible] these alternatives [illegible]

h. [illegible] (Alternatives [illegible] [illegible]

4.1.8 [illegible]

a. [illegible] and benefits of [illegible].

Table III-6 – Summary of Benefits and Costs for Alternative Plans [illegible]

Item	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Investment Costs	77,967,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Average Annual Costs	7,325,000	10,374,000	[illegible]	[illegible]	[illegible]	[illegible]
Net Annual Benefits	11,132,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Benefit/Cost Ratio	2.5	[illegible]	1.8	[illegible]	[illegible]	[illegible]

b. Property Values [illegible] would incorporate a [illegible] value of the property [illegible] from this [illegible] lity in the future [illegible] to expand [illegible]

c. [illegible]

veyor system under Alternatives 9 and 9A may increase in number, thereby increasing employment. Business providing support services for the special purpose vessels under Alternatives 10 and 10A, such as launching, fuel oil, and repairs, may experience an increase in employment. The [illegible] may continue during the off-season, since the special purpose vessels may be docked at the AmShip facility for rehabilitation and repairs. U.S. Steel may expand its existing facility under all of the proposed alternatives, thereby possibly increasing employment.

e. Business and Industrial Activity - Under all of the proposed alternatives, there may be an increase in steel and other product output due to easing of shipping constraints. Alternatives 9 and 9A would require the acquisition of land or rights-of-way for the conveyor for the 3-mile length of the Black River. Construction of the conveyor would disrupt businesses located adjacent to it. Alternatives 10 and 10A also require a conveyor, but of much shorter length, therefore, the disruption would be to a lesser degree. The 3-mile long conveyor of Alternatives 9 and 9A would require modification of U. S. Steel's present method of receipt of iron ore. Alternatives 9A and 10A would result in the loss of approximately 12.5 acres of presently vacant, commercial land, which would become aquatic due to bank cuts. Alternative 18 would result in the loss of approximately 12.0 acres and Alternative 18A, approximately 24.[illegible] acres. Businesses along the river may experience disruption and inconvenience during construction of the bank cuts - Alternative 9A: Riverside Park Cut and Cut A; Alternative 10A: Riverside Park Cut and Cut A; Alternative 18: Cut B, C, and D; and Alternative 18A: Riverside Park Cut, Cuts A, B, C, and D. Alternative 19 would cause the least amount of disruption to [illegible] Lorain Harbor users, since no major bank cuts would have to be made and minimal construction of land facilities would be necessary, unlike Alternative 9 which would require a conveyor to run along the west bank from the [illegible] to U. S. Steel. Support related businesses for the conveyor system under Alternatives 9 and 9A and for the special purpose vessels under Alternatives 10 and 10A, may increase (see para. 4.1.2, item d., Employment/Labor Force).

f. Displacement of Farms - The soil [illegible] of Bank Cuts A (Alternatives 9A, 10A, and 18A), B, C, and D (Alternatives 18 and 18A) has been designated as prime farmland by the U.S. Soil Conservation Service. [illegible] is situated in a commercial/industrial area [illegible] would ever be used as farmland. [illegible] cipated.

4.1.3 Environmental Effects

a. [illegible]

[illegible]

long-term decrease if U.S. Steel expands its facility. Alternatives 9 and 9A would result in a minor decrease in air quality due to the dust from the conveyor system operation. Dust collection systems would be provided at each transfer point. Since this is a highly industrialized area, the affects should be minimal.

c. Water Quality - Construction of any of the alternatives would result in a temporary decrease in water quality during construction and dredging operations, and a possible long-term decrease if U.S. Steel expands its facility.

Alternatives 9A, 10A, and 18A include the new Riverside Park Cut. The existing channel would be blocked by driving two sets of sheetpiling and filling the existing Black River channel between them so that the river's main flow would exit through the new channel cut. This would reduce sedimentation in the existing channel. Gaps would be provided in the sheet pile cells across the existing channel to avoid creating a stagnant pool along the west side of the treatment plant.

Under Alternatives 10 and 10A, using a special purpose vessel to transport cargo to U. S. Steel would not significantly affect the water quality since commercial craft already navigate the Federally maintained river.

d. Wetlands - No direct impacts under any of the proposed alternatives are expected. However, navigational improvements may increase future commercial development pressures in existing wetland areas.

e. Erosion - No impacts under any of the proposed alternatives are expected.

f. Threatened and Endangered Species - Although a State endangered species - silver lamprey - has been identified within the project area, the impacts of the proposed alternatives are anticipated to be no greater than existing harbor operation and maintenance procedures. Therefore, proposed commercial navigation improvements would not jeopardize the continued existence of this species.

g. Aquatic Resources - All of the proposed detailed alternatives include Outer Harbor breakwater modifications [illegible] 2,000 feet [illegible]. Removal of 600 feet of the East [illegible] [illegible] acre of substrate composed of silt, [illegible] would eliminate approximately [illegible] currently provided by the [illegible] sheetpile breakwater. The [illegible] cover approximately 1.01 [illegible] breakwater [illegible] rubblemound toe [illegible] sable benthic habitat. [illegible] fishery habitat [illegible] discontinue [illegible] extension of the [illegible]

fish community persists in Lorain Harbor. The amount of habitat provided and destroyed is summarized in the following table:

Table EIS-7 - Benthic Habitat Gained/Lost (Acres)

	Habitat Provided	Habitat Removed
Remove 600 feet of East Breakwater	0.69 Acre	0.20 Acre
Add 600 feet to Outer Breakwater	0.56 Acre	1.02 Acre

Dredging the Outer Harbor an additional 3 feet would result in the removal of approximately 380,000 cy of polluted dredged material and approximately 760,000 cy of nonpolluted dredged material for a total of 1,140,000 cy. Polluted material would be disposed of at the existing diked disposal site. Nonpolluted material would be disposed of at a designated open-lake site. Dredging would temporarily disrupt bottom habitat and increase turbidity and sediment load of the Outer Harbor waters. Since most of this area is already periodically dredged, (approximately once each year) no significant impacts are expected. However, approximately 20 acres of previously undredged bottom habitat would be dredged to enlarge the turning areas. According to the USFWS (see Appendix F of the Main Report), the conversion of relatively shallow, undisturbed areas into deep, annually dredged areas would decrease the spawning potential of the areas, reduce the benthic production of the areas, and reduce the annual fish biomass production of the areas.

Alternatives 9A, 10A, and 18A all require the Riverside Park Cut. Outer Harbor dredging, with the cut through Riverside Park, would result in the removal of 380,000 cy of saturated polluted material, 77,000 cy of saturated nonpolluted material, and 56,200 cy of rock, for a total of approximately 1,413,200 cy. Polluted material would be disposed of at the existing diked disposal site. Nonpolluted material would be disposed of at a designated open-lake site. That area of the harbor that has been previously dredged for commercial navigation would experience minimal impacts, including increased turbidity and sediment load.

According to the USFWS, the major impact of work in the Outer Harbor would involve the deepening of previously undredged areas to enlarge the turning areas and to create the new channel leading to the Riverside Park Cut. All of this new dredging would occur in the 70 acres of [illegible] habitat on the east side of the Outer Harbor. The Riverside Park Cut would require the dredging of approximately 3[illegible] acres of [illegible] habitat. The conversion of relatively shallow, [illegible] periodically dredged areas would decrease spawning [illegible] reduce the benthic production of the areas, and reduce the annual fish biomass production of the areas.

The cut through Riverside Park would [illegible] at the [illegible] result in the [illegible] material, [illegible]

and approximately 56,200 cy of rock, for a total of approximately 273,000 cy. The land area (approximately 5.4 acres) to be excavated for the channel would become aquatic. The bottom habitat created, however, would probably be of low value due to poor water quality, deep depths, and vertical channel side slopes.

Alternatives 9A and 10A both require a cut (approximately 12.5 acres) on the west bank of the river, upstream of the Erie Avenue Bridge. This upstream cut would be bulkheaded, thus affording no new aquatic habitat. According to USFWS, many of the fish species persisting in the Lower Harbor are dependent on the remaining shallow water areas, a narrow band bordering the navigation channel, and the limited cover provided therein. If spawning is occurring in this section of the river, in spite of the water quality degradation, it is probably occurring in these shallow water areas. Approximately [illegible] linear feet of this habitat would be eliminated by this cut. Approximately [illegible] cy of saturated, nonpolluted [illegible] material would be excavated by this cut, as well as, approximately 790,000 cy of unsaturated material, for a total of approximately 1,495,000 cy.

Alternative 10 requires a berthing facility for the special purpose vessel on the west bank of the Black River, upstream from Erie Avenue. No significant excavation is required for dockage of the vessel. However, steel sheetpile bulkheading would be required. This would not provide suitable aquatic habitat. That portion of potential shallow water habitat now existing between the navigation channel and the shore, (approximately 700 feet long X 70 feet wide) would be lost to deep depths.

Alternatives 18 and 18A both include Bank Cuts B, C, and D. Bank Cut B, on the west bank of the river, upstream of the [illegible] Bridge would result in the removal of approximately 270,00 cy of material which would be open-lake disposed. Approximately 4.3 acres of land would become water and the major portion of the bank would have a 1V:4H sideslope. Approximately 1,[illegible] linear feet of shallow water bank habitat would be eliminated.

Bank Cut C, on the east bank, downstream of the [illegible] Bridge, would require the removal of approximately [illegible] cy of material, which would be open-lake disposed. The major portion of the bank would have a [illegible] sideslope and approximately 2.[illegible] acres of land would become water. Approximately 700 feet of shallow water bank habitat would be eliminated.

Bank Cut D, on the east bank, [illegible] would require the removal of approximately [illegible] cy of material [illegible] disposed. The major portion of the bank [illegible] approximately 5.[illegible] acres of land [illegible] of shallow water bank habitat would be eliminated.

Alternative 18A, [illegible] Bank Cut A [illegible] would result in the removal of approximately [illegible]

[illegible]

1,[illegible] feet of shallow water bank habitat would be eliminated.

h. Terrestrial Resources - The conveyor system, included in Alternatives 9 and 9A, meandering upriver to U. S. Steel from the coal dock immediately west of the mouth of the Black River, would pass through primarily commercial and industrial land. Therefore, environmental impacts would be minimal. The area where the transshipment facility and storage piles would be located (west bank, upstream of the Erie Avenue Bridge - Alternatives 9, 9A, 10, and 10A) is presently vacant, sparsely vegetated land. Except for the possible negative aesthetic impact of additional storage piles in the area, no major impacts are expected.

Alternatives 9A and 10A both require a cut on the west bank of the river, upstream of the Erie Avenue Bridge. The land taken to provide the cut (approximately 12.5 acres) is presently vacant and sparsely vegetated, thus terrestrial impacts should be minimal. The soil in this area has been designated as prime farmland by the U. S. Soil Conservation Service. Because this land is situated in a commercial/industrial area, there is little chance that it would ever be used as farmland. Therefore, no impacts in this regard is expected.

Alternatives 9A, 10A, and 10A all include the cut through Riverside Park. The cut through Riverside Park would be approximately [illegible] feet wide and [illegible] feet long at its centerline, and have vertical steel sheetpile walls. The land to be excavated for the channel (approximately 3.4 acres) would become impervious.

Alternatives 10 and 10A both include Bank Cuts B, C, and D. Bank Cut B is on the west bank of the river, upstream of the [illegible] Bridge. The major portion of the bank would have a [illegible] slope. Approximately 4.3 acres of wooded habitat would be lost. According to [illegible], this area is of very limited wildlife value because of prior commercial development. Since land is presently vacant, these impacts should be minimal.

Bank Cut C is on the east bank, downstream of the [illegible] Bridge. The major portion of the bank would have a [illegible] slope. Approximately 2.5 acres of land would be lost. According to [illegible], this area is of very limited wildlife value because of prior commercial development. Since land is presently vacant, these impacts should be minimal.

Bank Cut D is on the west bank, upstream of the [illegible] Bridge. The major portion of the bank would have a [illegible] slope. Approximately 2.5 acres of land would be lost. According to [illegible], this area is of very limited wildlife value because of prior commercial development. Since land is presently vacant, these impacts should be minimal.

Alternative 10A requires an [illegible] Erie Avenue Bridge. The [illegible] this cut (approximately 12.5 acres) [illegible] vegetated, these impacts should be minimal.

4.2 Alternative 11 [illegible]

4.2.1 Social Effects.

a. Noise - There would be a slight increase in noise as more ships utilize the harbor in response to minor economic growth in the study area.

b. Transportation - The No-Action Alternative allows cargo movements within the current harbor configuration by vessels up to 730 feet by 75 feet, with a draft of 25.5 feet. Harbor modifications would be necessary for safe and efficient operation of larger vessels. As vessel traffic increases to handle projected increases in tonnage, existing problems related to safe and efficient navigation would intensify. There would also be an increase in the number of openings of the Erie Avenue bridge due to increased vessel traffic, thus increasing inconvenience to motorists.

c. Community and Regional Growth - There would be a slight increase in growth in the area. However, the port facilities would not be able to handle vessels larger than 730 feet x 75 feet. This may inhibit growth of businesses and industries in the area, slowing community and regional growth.

d. Displacement of People, Aesthetics, Recreation, [illegible] Cultural Resources - No impact.

4.2.2 Economic Effects.

a. Property Values and Tax Revenues - No significant impacts expected.

b. Employment/Labor Force - Slight increase expected due to possible business and industrial growth.

c. Business and Industrial Activity - Slight increase expected. Since the port would not be able to handle vessels larger than 730 feet x 75 feet, no major expansions of port [illegible] are expected.

d. Public Facilities and Services, [illegible] - No impact.

4.2.3 [illegible]

a. [illegible]

b. [illegible]

[illegible]

to increase due to the industrial nature of the area and its use as a commercial port.

f. Terrestrial Resources - Wildlife habitat is not expected to increase due to the industrial nature of the area and its use as a commercial port.

5. LIST OF PREPARERS

5.1 The following people were primarily responsible for preparing this Environmental Impact Statement:

Name	Discipline/ Expertise	Experience	Role in Preparing EIS
Mary Jo A. Braun	Political Science/ Social Science	[illegible] years, EIS Studies, Buffalo District	EIS Coordinator, [illegible]
William E. Butler	Geography/Physical, Social	[illegible] years, EIS Studies, Buffalo District	EIS Coordinator
Philip E. Berkeley	Biology/Wildlife Biology	[illegible] years, EIS Studies, Buffalo District	[illegible]
Timothy T. Daly	Social Science/ [illegible]	[illegible]	[illegible]
Edward J. [illegible]	Civil Engineering	[illegible]	[illegible]

6. PUBLIC [illegible]

6.1 [illegible]

[illegible]

preliminary designs and cost estimates to the principal study participants. These meetings afforded interested parties and the general public an opportunity to express their views concerning the improvements desired and the need and advisability of execution. These meetings were attended by four basic interest groups. These groups were: (1) commercial and industrial interests; (2) social, environmental, and recreational interests; (3) local government and planning interests; and (4) general public interests.

6.1.2 At the end of the preparation of the Preliminary Feasibility Report (PFR), a commercial navigation workshop meeting was held at the [illegible] City Hall on 4 February 1981 to discuss the findings of the preliminary study with local interests. Minutes of this meeting are contained in Appendix [illegible] of the Main Report. This meeting resulted in the District examining alternatives which would result in bringing 1,000-foot vessels directly to the storage area on the west bank [illegible] from the [illegible] facility.

6.1.3 A second commercial navigation workshop was held on 7 April 1981 to present the findings of the evaluation of the new alternatives [illegible] by local interests at the 4 February 1981 meeting. The [illegible] that the preliminary [illegible] of the [illegible] February 1981 meeting [illegible]. (Minutes of this meeting are [illegible].) They were also [illegible] to be [illegible] at the [illegible] this study, offered to [illegible] selected [illegible] and their [illegible] that they [illegible] upriver transshipment [illegible] conveyor and [illegible].

6.1.4 On 17 [illegible] Great Lakes [illegible] Feasibility Report [illegible] (revised May 1981) [illegible] 4 February 1981 [illegible]

6.1.5 [illegible]

interests affected by [illegible] actions at [illegible] Harbor and the [illegible] River.

6.1.7 The coordination has been [illegible] by making [illegible] available in advance of [illegible]. [illegible] for discussion and questions concerning the study were [illegible] so that meeting [illegible] could be prepared with specific [illegible]. [illegible] throughout the study to [illegible] that the [illegible] of the majority are made manifest and that the [illegible] plan of action will be acceptable to their interests even if the [illegible] Plan is selected.

6.2 Required Coordination

This section describes the [illegible] required coordination with other agencies and groups, particularly coordination that is to be [illegible] by circulation of this EIS for review and comment.

6.2.1 This DEIS is adequate to comply with the [illegible] Act of 1977 for this stage of project development. [illegible] information will be developed to comply with Section [illegible] of the Act during the [illegible] stage or further engineering and design [illegible] of dredged or fill material. The National Environmental Policy Act of 1969 (NEPA) requires that this DEIS be circulated for review and comment to all Federal and State agencies having jurisdiction by law or special expertise with respect to any environmental impact involved, or authorized to develop and enforce environmental standards. In order to [illegible] full compliance with the [illegible] Act, National [illegible] Preservation Act, Clean Air Act, [illegible] and Land and Water Conservation Fund Act, this DEIS [illegible] appropriate Federal and State agencies [illegible]. Comments will also be requested from all other parties [illegible] State and local [illegible]. This DEIS, any [illegible], and any underlying documents will be made available to the [illegible] the provisions of the Freedom of Information Act (5 USC 552).

6.3 [illegible]

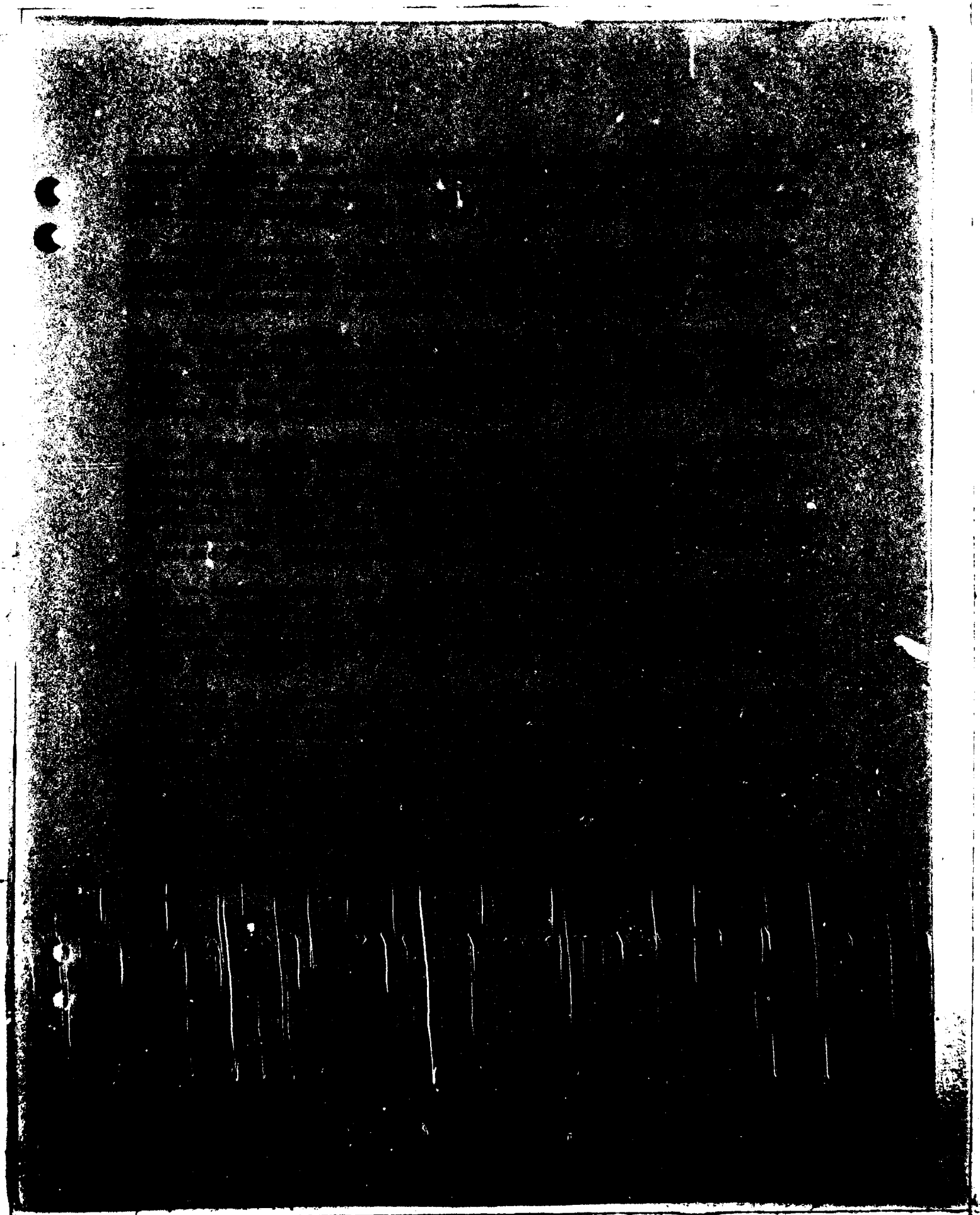
6.3.1 The following agencies, groups, and individuals [illegible] of the Draft Phase [illegible] Report and DEIS for review and comment.

a. Federal

Advisory Council on Historic Preservation
[illegible]

[redacted]

[redacted]



7. INDEXES, [illegible], AND [illegible]
(Tentatively [illegible] Plan [illegible] Alternative [illegible])

Subject	[illegible]	[illegible]	[illegible]
Affected Environment	[illegible]	[illegible]	[illegible]
Alternatives	[illegible]	[illegible]	[illegible]
Aquatic Habitat	[illegible]	[illegible]	[illegible]
Areas of Controversy	[illegible]		
Comparative Impacts of Alternatives	[illegible]	[illegible]	[illegible]
Cover Sheet	[illegible]		
Displacement of People	[illegible]		
Environmental Conditions	[illegible]	[illegible]	[illegible]
Environmental Effects	[illegible]		[illegible]
List of Preparers	[illegible]		
Major Conclusions and Findings	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]		

7. INDEXES, REFERENCES, AND APPENDICES (Cont'd)
(Tentatively Selected Plan is Alternative [illegible])

Subject	Environmental Impact Statement	[illegible]	[illegible]
Plans Eliminated from Further Study	pp. EIS-16-EIS-20	pp. 119-130	Appendix C
Public Concerns	pp. EIS-12-EIS-13	pp. 37-[illegible]	Appendix E, F
Public Involvement	pp. EIS-51-EIS-54	pp. 3-4	Appendix E
Public Involvement Program	pp. EIS-51-EIS-53	pp. 3-4	Appendix E
Public Views and Responses	pp. EIS-54-EIS-56	pp. 3-4; 120-122, 126-129	Appendix E, F
Relationship to Environmental Requirements	pp. EIS-[illegible]-EIS-[illegible]	pp. 181, [illegible]	Appendix F, [illegible]
Required Coordination	p. EIS-51	p. 181, pp. 184-185	Appendix F, E
Riverside Park	p. EIS-41	-	-
Significant Resources	pp. EIS-[illegible]-EIS-41	pp. 10-37	Appendix F, [illegible]
Statement Recipients	pp. EIS-[illegible]-EIS-[illegible]	-	-
Study Authority	p. EIS-[illegible]	p. 1	[illegible]
[illegible]	[illegible]	p. [illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

7. [redacted] (Cont'd)
(Tentatively Selected Plan at Alternative 10)

Subject	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]
Unresolved Issues	p. [redacted]	-	-
Water Quality	pp. [redacted]	pp. 10-19	-
Wetlands	pp. [redacted]	pp. 34-36	Appendix F
Without Conditions (No-Action)	p. [redacted]	pp. 57-60	Appendix B, F


DATE
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