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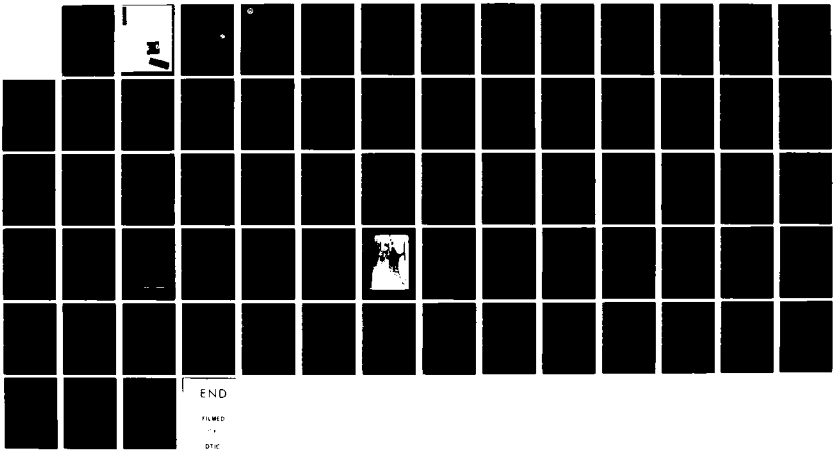

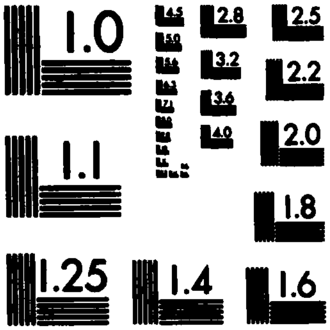

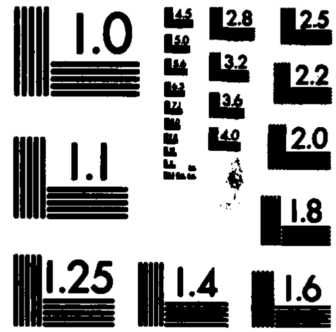

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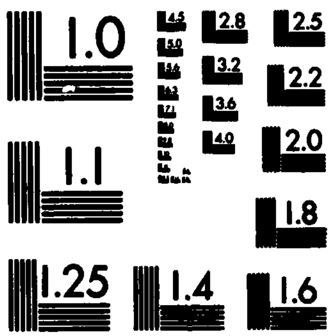

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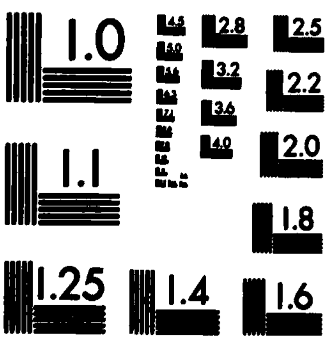

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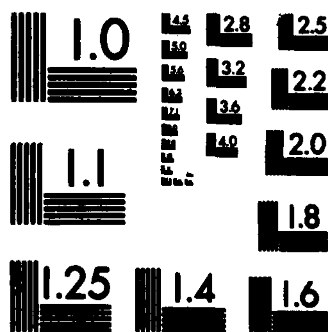

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Environmental assessment
Grand Marais

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

The District has assessed the environmental impacts associated with harbor and maintenance activities in Grand Marais Harbor: it has concluded that the action does not significantly affect the environment and no environmental impact statement was prepared. Maintenance activites include breakwater repair, dredging of the small-boat harbor, and dredge material disposal. The site consists of two breakwaters, concrete seawalls, and a small-boat harbor.

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DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
1210 U. S. POST OFFICE & CUSTOM HOUSE
ST. PAUL, MINNESOTA 55101

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NEGATIVE DECLARATION

In accordance with the National Environmental Policy Act of 1969 (NEPA), and Section 122 of the 1970 River and Harbor Act, the St. Paul District, Corps of Engineers, has assessed the environmental impacts of the following project:

OPERATION AND MAINTENANCE
GRAND MARAIS HARBOR, MINNESOTA
LAKE SUPERIOR

The environmental review process indicated that the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an environmental impact statement will not be prepared.

An environmental assessment report, which indicates the reasons why a statement is not required, is on file in the District Office and will be available for public review upon request. Those who have information that may alter the assessment and lead to a reversal of the decision should notify the District Engineer immediately.

9 January 1975

MAX W. NOAH
Colonel, Corps of Engineers
District Engineer

ENVIRONMENTAL ASSESSMENT REPORT

OPERATION AND MAINTENANCE

GRAND MARAIS HARBOR

COOK COUNTY, MINNESOTA

LAKE SUPERIOR

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
1135 U.S. POST OFFICE AND CUSTOM HOUSE
ST. PAUL, MINNESOTA 55101

DECEMBER 1974

ENVIRONMENTAL ASSESSMENT REPORT
OPERATION AND MAINTENANCE
GRAND MARAIS HARBOR
COOK COUNTY, MINNESOTA
LAKE SUPERIOR

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

ENVIRONMENTAL ASSESSMENT REPORT
OPERATION AND MAINTENANCE
GRAND MARAIS
COOK COUNTY, MINNESOTA
LAKE SUPERIOR

INTRODUCTION

The purpose of this report is to assess the environmental impacts associated with the St. Paul District, Corps of Engineers harbor maintenance activities in Grand Marais Harbor. This assessment has been drawn largely from an environmental report prepared by National Biocentric, Inc., under contract with the Corps of Engineers. National Biocentric's report is on file in the St. Paul District office.

1.000 Project Description

1.100 Project Location. Grand Marais Harbor is located in Cook County on the north shore of Lake Superior approximately 106 miles northeast of Duluth, Minnesota, and 45 miles southwest of Grand Portage, Minnesota, near the United States-Canadian international boundary. It lies at latitude 49°47' N and longitude 90°21' W. (See exhibits 1 and 2, pages A-1 and A-2.)

1.200 Project Purposes. Grand Marais Harbor presently serves two functions for northeast Minnesota: it is a base of operations for commercial fishermen, and it is the only Corps-maintained harbor-of-refuge in the 126-mile stretch between Two Harbors and the Canadian border. Until recently Grand Marais served also as a shipping point for pulp logs, but this activity ceased in 1972. Recreational boating activity is likely to increase in the next few years as tourism, already the foremost industry of Grand Marais, increases due to several new developments in the region (see paragraph 2.635).

1.300 Project Authorizations. Corps of Engineers jurisdiction over Grand Marais was authorized in 1879, when House Executive Document 75, 73d Congress, 2d Session, was enacted. This initial legislation provided for the construction of breakwater structures and dredging of the harbor bottom. Authority to construct concrete seawalls across a low ledge in the southeastern corner of the harbor was given in 1935, under the provisions of Rivers and Harbors Committee Document 27, 72d Congress, 1st Session. Finally in 1960-1961, House Document 187, 81st Congress, 1st Session, 17 May 1950, provided for the construction and dredging of a small-boat basin in the northwest part of the harbor.

1.400 Existing Project. Corps activity in the natural harbor has been limited to the construction and maintenance of seawalls and breakwaters, as well as the development and maintenance of the anchorage basin and the small-boat basin. Government maintenance of Grand Marais Harbor commenced in 1880 with the construction of a 350-foot, rock-filled timber crib breakwater, extending 7 feet above the lake, on the eastern edge of the entrance. Dredging activities were initiated to coincide with the construction, and a harbor anchorage area of 26 square acres with a depth of 16 feet was developed. In 1900-1901, the 350-foot west outer breakwater was constructed, the two breakwaters thereby reducing the harbor entrance width to 500 feet. The west outer breakwater was likewise constructed of rock-filled timber cribs capped with concrete, but construction of this breakwater also included a rubble mound base protected by riprap. Concrete seawalls, 6 to 7 feet above lake level, were built in 1935 across a low ledge of rock at the southeastern corner of the harbor. The anchorage basin was further dredged and enlarged to 36.5 acres while depths at the harbor entrance were increased to 16 and 18 feet, respectively. Finally in 1960-1961, a small-boat harbor, 100 feet wide, 520 feet long, and 8 feet deep, was dredged on the northwest side of the harbor; and a 921-foot rubble mound breakwater, constructed to run in an approximate west to east direction, was placed there for further protection of small craft. The total cost of all new Corps construction in Grand Marais Harbor was $451,000, while the total maintenance cost was $238,000. The project as constructed is shown in exhibits 2 and 3, pages A-2 and A-3. A perpetual easement over 0.13 acre of land for the harbor has been furnished by local interests, and a perpetual easement over 0.06 acre of land has been acquired for a gaging station on Lake Superior at Grand Marais.

1.500 Improvement by Others. The village of Grand Marais built a city pier for recreational craft at the north end of the harbor. At present, the pier consists of one longshore concrete dock with mooring space for five to eight boats. There is a boat launching ramp adjacent to it. The dock is frequently filled to capacity; however, the overflow can usually find docking space at nearby finger piers owned by commercial fishermen or former commercial fishermen. Gasoline is also available from the fishermen.

1.510 No other dockside facilities exist, but boaters are free to use restrooms, showers, and public telephones at the adjacent municipal campground and can obtain water there. The village of Grand Marais owns and operates the campground, which is on the northwest side of the harbor between the harbor and U.S. Highway 61. There are approximately 100 tent and trailer sites with shower facilities and electrical hookups. Supplies and services are also available in the Grand Marais central business district, about 1/4-mile from the harbor.

1.511 A log dock is located at the east end of the harbor, but is no longer in use. Next to the easternmost part of the harbor is a Coast Guard station manned by volunteers from the Coast Guard Auxiliary who are assisted by a Coast Guard staff member.

1.512 Local interests would like to improve the marina by adding finger piers for more docking space and by installing gasoline pumps.

1.600 Future Structures. There are no present plans for extensive work of new structures in the harbor over the next 10-year period.

1.700 Operation and Maintenance. The purpose of the Corps of Engineers structures in the Grand Marais Harbor is to maintain the harbor entry and to provide navigational safeguards. The principal operation and maintenance activities attendant to this end involve breakwater repair, dredging, and dredge material disposal. The present requirement for maintaining the harbor and related structures extends back to 1879. Exhibit 4, page A-4, denotes expenditures and actions taken prior to the present time. Experience at Duluth-Superior Harbor indicates that with on-land disposal, dredging costs run to about $5 per cubic yard. The cost of dredging when in-lake disposal is permitted is approximately $2 per cubic yard and perhaps $0.50 more when beach nourishment is anticipated.

1.710 Breakwater Maintenance. The crane barge MARKUS (DKS-20) attended by the tug DULUTH and the tender FAIRCHILD (CLEVELAND), as well as the derrick barge COLEMAN attended by the tug LAKE SUPERIOR and the tender BAYFIELD, are the usual complement of equipment used to repair the Grand Marais breakwaters. The MARKUS (DKS-20) and the COLEMAN can be used to transport repair equipment and supplies and can be equipped with a mechanical rock grapple for hoisting, moving, and placing boulders at the repair site. Maintenance consists primarily of replacing rock torn from the Grand Marais breakwaters during Lake Superior storms.

1.720 Dredging. In the recent past, Corps of Engineers maintenance dredging in Grand Marais Harbor has been performed by the COLEMAN and MARKUS (DKS-20) in conjunction with tugs, tenders, and bottom dump scows. Future dredging will probably be carried out by the same or similar equipment. At the present time, the St. Paul District, Corps of Engineers does not have any hydraulic dredging equipment on Lake Superior, nor would hydraulic dredging be possible due to the rocky nature of the bottom. Over the period from 1950 to 1972 an annual average of approximately 200 cubic yards of Corps-conducted maintenance dredging was performed in the harbor, with fiscal year 1971 being the last year of Corps-maintained dredging. At that time, 1,950 cubic yards of material were dredged. Future maintenance dredging activity, to be initiated in fiscal year 1975, is expected to be minimal with a total of approximately 3,000 to 4,000 cubic yards of storm-deposited material to be dredged from the inner harbor during the next 10 years.

1.721 Sediments from the harbor consist mainly of sand, gravel, and rock. Grand Marais is a pocket harbor, and as such has no streams flowing through it. Consequently, there is little accumulation of sediments due to fluvial action; and there is, likewise, limited possibility for municipal runoff or industrial effluent to enter the harbor. Rather, the primary influences on sedimentation in Grand Marais Harbor are the wave action of Lake Superior, the recreational boating activity, and finally those contributions made from the historic rafting of logs on the east edge of the harbor.

1.722 The influence of Lake Superior, primarily through wave action and littoral current, causes a suspension of bottom sediment material which allows for the trapping of both organic and heavy metal chemicals in the sediment. Further, accumulation of sand and gravel occur when sediments, washed from other beaches along the harbor and from the harbor bottom, are picked up by storms and thrown over and through the inner breakwater into the inner harbor. The recreational boating activity contributes grease, organic matter, nutrients, and heavy metals to the water. The historic log drafting has contributed wood chips and bark to the floor of the harbor, which are responsible for the high levels of volatile solids, COD, and oil and grease which have been observed.

1.723 The sediment material has to be removed from the inner harbor every 4 or 5 years. The outer harbor has not been dredged since 1939.

1.730 Dredged Material Disposal. During the dredging operation, dredged materials are placed by the clam-shell dredge into bottom dump scows for removal from the dredge site to the disposal area. Prior to 1968, dredged materials from Grand Marais Harbor were redeposited in Lake Superior, at a depth of 50 feet, 1 mile south-southeast of the harbor entrance. At various times in the past, dredged sand, gravel, and rock have also been used for road construction. As of 1968, 100 percent of the dredged material has been disposed of on-land.

1.731 Grand Marais Harbor is not classified by the Environmental Protection Agency (EPA) as either polluted or unpolluted at the present time, pending EPA reanalysis of the material on the harbor bottom, which was requested by the Corps in December 1974.

1.740 Dredge Disposal Program. While the pollutional status of Grand Marais Harbor is undetermined, three disposal alternatives are open to consideration: dredged material could be utilized as beach nourishment on the eastern beach of the gravel spit north of the Coast Guard station; dredged material could be deposited in the open lake; or it could be temporarily (a few days to a few weeks) stockpiled for utilization by area construction companies. The disposal method for each specific operation will be planned in coordination with EPA and will be subject to EPA approval.

1.741 If the harbor is classified "unpolluted", the above-mentioned disposal methods would continue to be the disposal alternatives utilized by the Corps in their dredging operations.

1.742 If the harbor is classified "polluted", the disposal method implemented would probably be the temporary stockpiling of dredged material until it can be hauled away for use by area construction companies. Those companies, utilizing the dredged material, would be expected to make an agreement with the Corps, assuring removal of the material within the specified time limit. Two sites have been considered for the on-land temporary disposal. One site would be north of the western end of the inner breakwater pier on municipal park land. The second site would be on the eastern edge of the harbor, north of the Coast Guard station. Both sites are accessible for unloading of the dredged material from a scow by a land-based crane, or directly by the MARKUS (DKS-20). It is expected that because of the high demand for gravel, dredged material at either of the two sites would be removed for use within a short period of time of deposition, as has been past experience.

2.000 Environmental Setting

2.100 General. Information to describe the environmental setting of the Grand Marais Harbor project has been expanded to include the regional setting since the project area is rather small and would be difficult to discuss in relation to the rest of the environment if it were considered alone. Consequently, the area around Grand Marais and Cook County, Minnesota, is discussed as a whole in an effort to present a better understanding of the existing environmental setting. The biological discussion is broadened to include a characterization of the north shore and Lake Superior.

2.200 Geographic Setting. The harbor occupies a small natural embayment, semicircular in shape, and is one of the few natural harbors along the rocky, storm-swept north shore. The bay was formed by the differential erosion of the ancient lava flows and resistant diabase sills. The entrance to the 70-acre bay is through a natural 1,000-foot wide gap in the rock ledge on the scuth, or lakeward, side of the harbor. On the east the rock ledge is connected to the shore by a low gravel spit. The lakeshore in the Grand Marais area is generally rugged, bold, and rocky. At intervals along the shoreline the rocky face gives way to stretches of beach consisting of pebbles and stones.

2.300 Physical Environment

2.310 Climate. The Lake Superior basin has a typical humid continental climate, characterized by cold, dry winters and warm, humid summers. However the lake exerts a strong microclimatic influence on the immediate shoreline, generally resulting in cooler summer temperatures and warmer winter temperatures than those experienced a few miles inland. This moderation of the immediate shoreline temperatures can amount to as much as 15 to 20 degrees in winter and 20 to 30 degrees in summer. At Grand Marais the average annual temperature is 37.6^{o} F. The average January and July temperatures are 14.1^{o} F and 59.2^{o} F, respectively. The maximum and minimum temperatures ever recorded at Grand Marais are 100^{o} F and -34^{o} F, respectively. Despite its high latitudinal position, 45^{o}N, the ameliorating influence of the onshore breezes results in a growing season with an average duration of 136 days that extends from 21 May to 4 October.

2.311 The water temperature of Lake Superior at Grand Marais ranged from 32^{o} F to 52^{o} F. Ice will form in the harbor during the frigid winter months but is usually broken up by storms; hence it is of short duration, and the harbor is usually open to local traffic during the coldest weather.

2.312 The average annual precipitation at Grand Marais is 24.71 inches with precipitation occurring throughout the year. The driest month is February, with 1.08 inches of precipitation; and the wettest is September with 3.43 inches of rainfall. Annual snowfall averages between 60 and 70 inches; the ground is covered with 1 or more inches of snow for at least 140 days of the year.

2.313 Thunderstorms, often resulting from the collision of unlike air masses, are the principal source of rain during the warmer months. The Lake Superior Basin has an average of 27 thunderstorms a year. Inversion fog, created by contrasting bodies of warm, moist air mixing with cold surface air, is a common occurrence on and near the lake most of the year.

2.314 Prevailing winds are from the northwest and northeast. Wind velocity exceeds 30 mph on an average of 30 days of the 5-month (May to September) small-craft boating season. Storms accompanied by high winds, particularly out of the northeast or southwest, blow up quickly and are characteristic of the fall season.

2.315 During heavy gales, 12-foot waves are common and gale force winds have generated lake waves as high as 16 feet, which crash over the breakwaters and deposit sand and gravel in the harbor basin.

2.316 The harbor is subject to extreme temporary fluctuations of water level caused by changes in wind and barometric conditions. During these fluctuations, water levels in the harbor will vary as much as 1 foot below to 2 feet above the mean lake level prevailing at the time. Ordinarily seasonal variations extend from zero to 1 foot above the 601.6-foot low water datum.

2.320 Geology. The present-day shoreline of Lake Superior was shaped largely during the Great Ice Age, which extended from a few hundred thousand years ago to several thousand years ago. During this period, successive ice sheets advanced and retreated over the area, filling valleys, gouging out lakes, and forming ridges and hills. Each advance of the ice buried and destroyed many of the older land forms; the appearance of the present landscape is due largely to the effects of the last advance, the Wisconsin glaciation, and postglacial events.

2.321 When the last ice began to retreat from the present Lake Superior area, a series of large lakes came into existence, ponded between the ice lobe in the Lake Basin and the highlands to the south. The Labradorial Lake of the Wisconsin ice sheet dammed up the northward drainage of the glaciers, and Glacial Lake Duluth was formed by its meltwater approximately 11,000 years ago. Lake Superior is a remnant of the former Lake Duluth. The former shoreline of Lake Duluth extended 4 to 5 miles inland from the present shoreline of Lake Superior and the beaches of this prehistoric lake can still be seen in several areas along the North Shore. The plateau a mile north of the Grand Marais Harbor is a remnant of a beach of Glacial Lake Duluth.

2.322 Amygaldaloidal tops of lava flows are well exposed along the north shore. Amygdaloid is a cellular igneous rock, usually formed at the top of a lava flow, whose cavities have been filled with minerals deposited from solution. On the beach and in gravels along the north shore are found agates and Thompsonite, which occur as vesicle fillings in various lava flows and are freed by weathering and erosion. (Vesicles are pores left in a lava flow by gas bubbles that formed in the molten rock.) On the north side of the Grand Marais Harbor is a pebble beach composed entirely of smooth, flat pebbles and stones. The stones represent different kinds of local rock but all are of the same flat disk-like shape, for stones of this shape have the greatest survival value on a wave-pounded beach. Spherical stones roll away, usually back into the lake, but flat stones tend to retain their position on the beach.

2.330 Topography. There is a general postglacial, north to south, 5 to 15-degree tipping of the Lake Superior Basin, resulting in a scarcity of good harbors along the north shore and the "drowning" of several river mouths along the south shore of the lake. The topography of Grand Marais slopes from the harbor upward to the Superior Upland to the North. The community is situated on a low terrace which rings the harbor. Elevations range from 600 feet above sea level at shore to 1500 feet 1 mile north of the harbor. The land surface consists of 15 to 40 feet of sand, clay, and gravel of glacial and lacustrine deposition overlying the lava and diabase sill below. The makeup of the harbor bottom varies from well graded gravel in the northeast portion to a predominantly coarse gravel mixed with clay and small boulders near the harbor entrance.

2.340 Soils. Soils in the area tend to be shallow, coarse, stony, and acidic in nature and are characterized as arising mainly from Ontonagon Rock Group outcrop and weathered glacial debris. The rock outcrops are mostly basic igneous rock, and the light-colored Ontonagon Group is formed from weakly calcareous red lacustrine clays that were deposited in glacial Lake Duluth when its waters covered the present shore. Neither the soils nor the sloping topography are particularly conducive to agriculture. Today less than 0.3 percent of the total area of Cook County is used for agriculture, and hay is the most common crop.

2.400 Hydrologic Environment

2.410 Surface Water. Grand Marais Harbor is located in the Lake Superior Watershed Unit as described by the Minnesota Department of Natural Resources. All waters within this watershed unit flow into Lake Superior, continuing through the Great Lakes and the St. Lawrence River and eventually into the Atlantic Ocean. With the exception of Lake Superior, water resources in the Grand Marais area are limited to a number of short streams which drain the Superior Uplands; however, there are also several flowing springs which are fed by underground seepage from the highlands to the north.

2.420 Groundwater. The thin covering of glacial drift (zero to 40 feet thick) and the complexity and imperviousness of the bedrock are responsible for the lack of abundant groundwater in the area. The basaltic lava is an unpredictable aquifer; private wells have revealed a variety of subsurface conditions and a great variation in the yield and character of the generally hard groundwater. Private wells in the city range from 15 to 40 feet deep and produce adequate quantities of water for private dwellings; whereas, private wells near but outside the city have been drilled from 9 to 723 feet deep with yields of very small quantity. Most groundwater is found in fractures, fissures, and interflow zones in the lava.

2.430 Water Quality. The eutrophication (nutrient enrichment) process in Lake Superior is apparently progressing at an extremely slow rate as dictated by nature, with little or no alteration by human activity. Therefore, the measured changes in water quality are misleading when viewed from the eutrophication standpoint alone. The effect of human activity on Lake Superior could be more readily seen in the examination of other chemical and physical parameters.

2.431 The introduction of halogenated and chlorinated hydrocarbons are recent and a function of human activities. At present there is no information on the levels of these compounds in Lake Superior. Measurement of these parameters is important because of the deleterious effects of the parent compounds or their breakdown products. The presence of heavy metals, taconite tailings, and asbestos-like materials is acknowledged, although their effects are still undetermined.

2.432 Lake Superior, the dominating body of surface water in the area, is characterized by soft water. Hardness is approximately 44 pp, C_aCO3. The pH is approximately 7.5. Water temperatures in Lake Superior fluctuate slightly, ranging between 40° F and 50° F most of the year.

2.433 Shipping has been responsible for some water quality degradation in the open waters and harbors areas of Lake Superior. Oil discharges, bilge wastes, and garbage from commercial vessels plying the lake have created occasional problems. However, enforcement programs have become more stringent in recent years, and the problem is not yet considered acute.

2.434 The Lake Superior water quality generalizations mentioned above are appropriate for most of the inshore waters. The widespread indications of change and deterioration observable in the inshore waters of the other Great Lakes are, for the most part, not apparent in Lake Superior. There are exceptions, however. These include water quality problems in the Duluth-Superior Harbor and at Silver Bay on Minnesota's north shore. Pollution loads released by paper and steel mills, and other industrial and municipal wastes dumped into the St. Louis River and Superior Bay, have created problems in the Duluth-Superior area.

2.440 Harbor Quality Control. Grand Marais Harbor is described as a "pocket harbor"; that is, it does not have a river or stream flowing through it which carries and deposits sediment loads. It is a relatively unsheltered harbor, subject to the wind and wave action of Lake Superior, which results in the movement and exchange of Lake Superior's cold, clear water with the harbor water. Other external factors, such as ship movement or discharges into the water, which influence Grand Marais Harbor, are minor when compared to the influence that Lake Superior has on the harbor.

2.441 Grand Marais Harbor has been subdivided into five zones to permit comparison between and within specific areas of the harbor. A large number of samples were collected from the harbor, and analyses revealed great diversity in most parameters. The analyses are, therefore, presented on a zone by zone basis to facilitate a critical examination and to make the interpretation less complex. (See exhibits 5 and 6, pages A-5 and A-6.)

2.442 Zone 1 is part of the outer project area in Grand Marais Harbor. The depths range from 16 to 20 feet. Zone 1 is influenced by the close proximity to the Wisconsin-Minnesota Timber Company facility. This area is influenced by the log rafting which took place in the harbor in previous years. The natural currents along the north shore would contribute sediments in this zone due to the action of counter-currents around the breakwater.

2.443 Zone 2 is the remainder of the Corps project area in the outer harbor. It is geographically located in the center of Grand Marais Harbor. The depth of the project in Zone 2 is maintained at 16 feet. The bottom sediments in this zone are influenced by its close proximity to the Wisconsin-Minnesota Timber Company facility and contains many wood chips on the bottom.

2.444 Zone 3 is that area of Grand Marais Harbor located between the Corps project area and the western shoreline. Water depths in this zone vary from 5 to 12 feet. This zone is bordered on the north by the breakwater which protects the small-boat harbor and on the west and south by the natural shoreline. The Consolidated Water Power and Light Company is located along the shoreline of this zone and may contribute some materials into the water.

2.445 Zone 4 is that area in Grand Marais Harbor located to the north of the outer project area; it is bordered by the small-boat harbor on the west and extends eastward to the shoreline. The water depth in this zone varies from 12 to 15 feet. The Standard Oil Company facility is located on the shoreline of this zone. Part of the shoreline is lined with steel cribbing which has been placed there by the Minnesota Highway Department. Runoff from storm sewers may enter the waters in this zone.

2.446 Zone 5 is that area inside the inner breakwater constituting the small-boat harbor. It encompasses the inner project of the Corps. The depth of this zone is maintained at 8 feet. This zone would be influenced by small-boat traffic into and out of the area.

2.447 Grand Marais has been sampled by the Environmental Protection Agency (EPA), National Biocentric, Inc. (NBI), and the University of Minnesota (UMD) over a 4-year period from 1970-1973. Thirty-one samples of bottom sediments have been collected and analyzed over this period. NBI and UMD collected and analyzed water samples as well. Since EPA did not do so, the number of water samples in a zone is less than the number of bottom sediments.

2.448 Of the seven samples collected by EPA only one was later analyzed to determine the organic and metal content of the sediment. Of the eight chemical parameters for which EPA has established maximum values, the sample values exceeded the guidelines for seven parameters (EPA guidelines for the eight parameters are shown in exhibit 7, page A-7). Only one exceeded value is necessary for a sample to be classified "polluted." The data on the samples collected by NBI and UMD generally confirmed the excessive values found by EPA. A more elaborate summary of the chemical analysis of the bottom sediments collected in Grand Marais Harbor is presented in the Technical Appendix (exhibits 8, 9, and 10, pages A-8 - A-14). Included in the data (exhibits 8 and 9) is a table listing by zone the mean for each parameter, as well as the standard for each mean, the range of values in each particular zone, and the number of observations for each parameter in the zone. The range of values of the bottom sediment analyzed in the investigation was broad. This variation was found both within a single zone in the harbor and between zones in the harbor. Although part of this variation was, perhaps, due to the fact that the samples were collected and analyzed by three separate laboratory groups, similar variation was found in samples collected and analyzed by a single laboratory group, indicating that there is a great deal of variation from site-to-site, within zones, and certainly throughout the harbor. The methods used to collect and analyze the bottom sediment samples were not able to deal effectively with the tremendous sample-to-sample variation that exists on the floor of the harbor. Furthermore, bottom sediment samples were taken with a Ponar or a Peterson Dredge which samples only the top 10 centimeters of the bottom sediment, biasing the results, since the surface of the sediments is likely to be the most variable with respect to its physical and chemical composition. It should be noted, also, that while the sediments taken from Grand Marais Harbor have been shown to register high values for organic parameters, the sediments collected do not represent the total environment of the harbor, but only that relatively small portion which could possibly be sampled.

2.449 The types of particles found in Grand Marais Harbor are characteristic of the soil found along and associated with the north shore of Lake Superior. These sediments are present primarily as a result of erosion from the natural watershed and deposition into the harbor. The mouth of the harbor is characterized by a sand beach which has been created by wave action. The waves constantly sift and move the sand, leaving a relatively coarse material deposited in and around the mouth of the harbor. The silt and clay found in Grand Marais are made up of very small particles which, because of their fine nature as contrasted to sand, have an increased number of sites available for the physical and chemical binding of the organic and metal compounds. Therefore, if such chemical compounds are present in the water, and if, as a result of wave action or boat traffic, they come into contact with the sediment, the silt and clay absorb high levels of these chemicals.

2.450 The water analyses of Grand Marais Harbor from the standpoints of transparency, lack of turbidity, alkalinity, and conductivity would rate the harbor as a body of clean water. The levels of these parameters were more consistent with the oligotrophic waters of Lake Superior than were those for any other harbor in Lake Superior. This appears to be due to the movement of water masses within the harbor, which is subject to water exchange with Lake Superior as a function of wind direction and barometric pressure. Water quality conditions change readily depending upon the movement of water masses within the harbor. Thus, the water quality data reflects the water mass which was in that zone at that particular time, rather than the overall local conditions or influences of the bottom sediment. This variation in water quality was exhibited in the wide range of quality values obtained by UMD and NBI in their investigations.

2.451 Dissolved oxygen (DO) levels were near saturation throughout the harbor and throughout the sampling period.

2.452 Temperature values reflected the time of year in which the samples were collected. The water quality data are further summarized in exhibit 11, pages A-15 and A-16.

2.453 The number of benthic organisms found in samples from the harbor was low except for in a few locations. Zone 5, the small-boat harbor, had the heaviest concentration of organisms while Zone 3 had the least. In one sample, collected from Zone 5, there was evidence of a decaying odor. Zone 5 also showed a relatively high population of <u>Tubifex</u> worms and <u>Ascellus</u>, a crustacean which is a scavenger usually associated with an enriched environment. The results of the plankton analysis indicated a uniform distribution of plankton organisms throughout all of the zones in Grand Marais Harbor. Water samples collected during June and July contained high levels of the organisms Synedra and Tabellaria, while the organisms Asterionella, Navicula, and Synedra were predominant species in samples collected in August. These organisms are all rated as oligotrophic types (those which inhabit clean water), indicating an oligotrophic situation. Persistent also in a majority of samples throughout the summer were the reported eutrophic algae, Diatoma and Fragilaria, indicators of an enriched or eutrophic (polluted) condition. The coliform bacteria counts found in Grand Marais were the lowest found in all the harbors along the north shore. In only one case did the fecal coliform count in samples collected from Grand Marais Harbor exceed the standard set by EPA, and that was a count taken from the proximate center of Zone 5.

2.454 It has been observed that certain zones tend to be high in all or related parameters and that specific samples contained high levels of certain parameters. In order to explore this phenomenon more fully, a correlation analysis was conducted on the results of the chemical analysis of bottom sediment samples from Grand Marais Harbor. A further correlation analysis was done on the results of the benthic organisms analysis. Charts depicting the various correlations can be found in exhibit 12, pages A-17 and A-18. Also included in the technical appendix is a summary defining correlation and its value as a scientific measure (exhibit 13, page A-19). It was discovered that high levels of certain parameters (e.g. total nitrogen) tended to be found in fine (silt and clay) bottom sediments. There was also a strong correlation between total volatile solids and COD and between nitrogen and total phosphorus. The fact that these particular pairs of correlations were highly significant may be due to the influence of the organic material contributed from the log-rafting activity in Grand Marais Harbor. These contributions are very high and would contribute large amounts of total volatile solids and COD, while they would contribute lower amounts of nitrogen and phosphorus. Results of the correlation analysis of the heavy metal parameters indicated that lead, zinc, and mercury tend to vary together, while correlations containing copper were less significant. It is thus probable that the source of copper in the sediments is different from the sources of lead and zinc. The results of the correlation analysis conducted between the levels of certain chemical parameters and total number of benthic organisms found in the samples with high levels of the organic parameters (TVS and COD) were likely to have few benthic organisms. The correlation between total organisms and nitrogen or phosphorus, while positive, was not significant; neither were the results of correlations between benthic organisms and the heavy metals scientifically significant.

2.455 There is difficulty in collecting bottom sediment samples as the dredge consistently bounces off the predominantly rock bottom. Thus, there has not been sufficient data to make any significant conclusions as to the "polluted" or "unpolluted" condition of Grand Marais Harbor. Therefore, EPA has not, at the present time, classified the harbor as either "polluted" or "unpolluted". Although EPA again attempted to collect samples in October 1973, they were unable to obtain any bottom sediment, hitting only rock or at best drawing up weeds and snails. Because of the extensive water mass movement between Lake Superior Grand Marais Harbor, it is important that a decision be made, so that necessary steps can be taken should Grand Marais be declared "polluted". As stated in section 1.740, an alternate dredge material disposal program is established to cover either verdict.

2.500 Biological Environment

2.510 General. The vegetation of the north shore is predominantly boreal coniferous forest. Cook County and the Grand Marais area have a wealth of vegetation. Of the 879,900 acres of Cook County, only 2.7 percent is classified as nonforest land. Mixed conifer-hardwood stands of fir and spruce have replaced the virgin red and white pine of the nineteenth century, which has been lost mostly to logging, fires, and land clearing.

2.511 The shoreline of Lake Superior is a composite of beaches, boggy areas, and upland forests. These areas provide habitat for a variety of fish and wildlife species. The aquatic environment and adjacent lands provide food and shelter for more than 100 species of waterfowl, shorebirds, songbirds, upland gamebirds, and birds of prey. However, the shoreline ecology in the vicinity of Grand Marais is rather fragile; the terrestrial vegetation is battered by open exposure to storm winds off Lake Superior.

2.520 Terrestrial Vegetation. Jack pine is the predominant pine, but white and red pine are frequently found, often mixed with white spruce and balsam fir. In exposed areas the low juniper is found. White cedar, and sometimes yew, are observed in lowlands and on rocky points and islands while black spruce and tamarack are dominant in bogs.

2.521 Deciduous trees are often mixed with the conifers. Aspen, paper birch, red and mountain maple, and mountain ash are frequently encountered. Along waterways, ash, yellow birch, and American elm may be found. In wetland and shore areas, balsam, poplar, willow, dogwood, and alder are common. Successional stages following forest disturbance are dominated by trembling and large-toothed aspen. The heart-shaped birch is often seen along the shore of Lake Superior, and ninebark, thimbleberry, and juneberry are among the common shrubs.

2.522 Herbaceous vegetation in the Grand Marais area includes such plants as false lily-of-the valley, wild sarsaparilla, big-leaved aster, Clinton's lily, goldthread, bunchberry, shield fern, bedstraw, shinleaf, dwarf raspberry, rose mandarin (or twisted stalk), starflower, and twinflower. In addition, there are many other species of sedges, grasses, composites, ericads, violets, club-mosses, ferns, orchids, and lilies that comprise a significant part of the flora.

2.523 In rocky crevices along the shore walls there are a variety of sedges, rushes, grasses, mosses, lichens, ferns, and herbs. Aquatic and emergent plants include yellow pond lily, various species of pondweed, water plantain, cattail, bulrush, arrowhead, burweed, horsetail, manna grass, spike rush, and wild calla.

2.524 The poorly drained sphagnum bogs often include leatherleaf, bluejoint grass, manna grass, willow, sedges, marsh cinquefoil, sweet gale, wool or cotton grass, spiraea, wild calla, cranberry, pitcher plant, sundew, Labrador tea, blueberry, laurel, and some orchids.

2.530 Wildlife. The wildlife resources in the area provide many hunters, photographers, and wildlife observers with recreation. A wide variety of game is available, most importantly the whitetail deer. The lakes and streams in the area are bordered by vast forests which support populations of other big game such as moose and black bear.

2.531 The area's virgin forests of presettlement times supported small numbers of game, in comparison with present numbers. Drastic changes followed settlement. Logging operations resulted in numerous openings in the vast forest canopy and increased supply of food and habitat for many forms of wildlife.

2.532 Most recent changes, however, in the form of urban expansion and increased human habitation, are having a negative effect on wildlife populations. Disappearing habitat as natural forest succession progresses and human encroachment occurs, together with pesticide use and various forms of pollution are factors which have a negative effect on the area's wildlife populations.

2.533 Approximately 50 species of mammals occupy the forests of the area. Among the more common are white-tailed deer, black bears, foxes, skunks, porcupines, squirrels, mice, weasels, beaver, and snowshoe hares. The moose and the endangered timber wolf are found along the more northerly reaches of the Minnesota shore. Also occupying the wilder portions of the boreal forest are rare or uncommon mustelids such as the pine marten, fisher, and otter.

2.534 Amphibians and reptiles are not abundant in the region, but there are perhaps a dozen species.

2.535 Many species of warblers nest along the north shore, including the parula, the chestnut-sided, the Blackburnian, the black-and-white, the blackthroated green, the Canadian, the myrtle, and the mourning. Sparrows include the chipping, the song, the clay-colored, the vester, the savannah, and the pine siskin. Loons, mergansers, mallards, grebes, and gulls are often seen along the shore. Many species of hawks and owls, as well as the endangered bald eagle, make the north shore of Lake Superior their summer home. In the fall the north shore is perhaps the most heavily traveled hawk migration route in the United States. Woodcock and ruffed grouse are the prominent upland gamebirds of the area.

2.540 Fish. A variety of fish species are found in the near shore or harbor areas of Lake Superior, among them are herring, whitefish,cisco, several species of trout, smelt, suckers, perch, sculpin, walleye, northern pike, bass, and bullhead. The lake trout has been gradually depleted over the years by the lamprey and heavy fishing pressure, but it remains as an important sport fish. Lake trout are slow growing, slow maturing, and have a low reproductive potential, making them less able to sustain their populations than most other fish species.

2.550 Plankton. The plankton of Lake Superior is sparse and dominated by forms characteristic of cold deep lakes. Recent studies show that diatoms are the most abundant plankton groups.

2.551 The most abundant forms of phytoplankton include: *Asterionella formosa*, *Dinobryon sp.*, *Synedra acus*, *Cyclotella sp.*, *Tabellaria fenestrata*, and *Melosira granulata*.

2.552 The following zooplankton have been listed as common in Lake Superior:

rotifers -	*Keratella cochlearis* and *Keblicottia longispina*
cladocerans -	*Daphnia longispina* and *Bosmina longirostris*
copipods -	*Diaptomus minutus*, *D. silcilis*, *Epischura lacustris*, *Limnocalanus macrurus*, and *Cyclops bicuspidatus*

2.553 The results of the plankton analysis of the water in Grand Marais Harbor indicate that there is a uniform distribution of plankton organisms throughout all of the zones in Grand Marais Harbor. Specifically the genera found were: *Scenedesmus*, *Fragilaria*, *Diatoma*, *Synedra*, *Dinobryon*, *Navicula*, *Asterionella*, *Rhizosolenia*, and *Tabellaria*. The mixture of oligotrophic and eutrophic organisms found is due to the influence of Lake Superior on the harbor. The movement of water from Lake Superior into the harbor in effect dilutes the waters of the harbor and brings in the oligotrophic organisms from the lake. The opportunity for flushing and exchange in Grand Marais Harbor is particularly great, for the harbor represents an indentation on the coastline with a relatively large and deep opening.

2.560 Benthos. The benthic (bottom dwelling) communities of Lake Superior are composed of a relatively young fauna, as Pleistocene glaciation removed much of the preglacial species of the region. As the ice retreated, the newly formed lakes were populated both by remaining species of the preglacial lakes and by those species that migrated in the wake of the melting ice. This occurred as recently as 4,000 to 8,000 years ago. (With such a short period of geological time, the rich fauna found in more ancient lakes has not had the opportunity to develop.) Lake productivity is also correlated with lake size, geographic location, and nutrient inflow based on past geologic history.

2.561 The amphipod (Pontoporeia affinis), the opossum shrimp (Mysis relicta), and the midge-fly genus (Hydrobaenus) are listed as the dominant members of the Lake Superior bottom fauna.

2.562 The organisms found during benthic investigation of the harbor were: Tubifex, Lumbriculidae, Chironomidae, Asellus, Limnodrilus, Ephippia, Copepods, and, to a lesser extent, Pontoporeia, Nematodes, Canthocamptus, Gryraulus, Caddis pupae, and immature worms. A sample taken inside of the east outer breakwater had a buildup of Tubifid worms, supporting the contention that, in a protected harbor, there is less mixing from wind action during severe storms; and the sediment (including the settling of plankton bodies) is able to stabilize adequately to support a community of invertebrate macrobenthic organisms.

2.570 Rare and Endangered Species. A check with the State Department of Natural Resources and the Federal Fish and Wildlife Service has failed to disclose the existence of rare and endangered species in the harbor area.

2.580 Natural Areas. Eighty percent of the land in Cook County is classified as commercial forest land, and of this, 65 percent consists of public land in the Superior National Forest. Much of the remainder is also under public ownership and is administered by the State of Minnesota or Cook County. The forest land combined with the numerous lakes, streams, waterfalls, and cascades, make the area an important resource for sight-seeing, outdoor recreation, fishing, and wildlife habitat.

2.600 Socioeconomic Environment

2.610 Archeological and Historic Investigations. No known historical or archeological features are located in the Grand Marais Harbor or in the Corps of Engineers project area. Both the National Register of Historic Places and the State Historical Society of Minnesota have been consulted regarding Grand Marais Harbor.

2.620 Historic Background. The natural harbor at Grand Marais was utilized by the Ojibway, who called the harbor "great pond". Later the French voyageurs gave the harbor the name it now carries. Interpreted literally, Grand Marais means "great swamp"; but in the special vocabulary of the voyageurs, "marais" referred to a harbor-of-refuge or a protected cove.

2.621 The first European settlement in Minnesota was located at Grand Portage, 45 miles north of Grand Marais. The Grand Portage was the primary overland canoe route from Lake Superior to the Canadian prairies, and the trading post that sprung up there took the same name. The rich history of the Grand Portage area somewhat overshadows that of Grand Marais.

2.622 It is known that the American Fur Company had a trading post at Grand Marais in 1834. Commercial fishing and logging added to the commercial base of the community.

2.623 During the latter half of the nineteenth century and the first part of the twentieth, Grand Marais Harbor was heavily used as a harbor-of-refuge by coastal freighters moving goods from Duluth to Port Arthur-Fort Williams and return. Lumber and gravel shipments accounted for the greater share of commercial shipping, while the community depended upon the harbor for virtually all its living supplies, not having highway or railroad facilities. By the year 1907, Grand Marais was a thriving community of 600, while Cook County's total population exceeded 3,000.

2.624 It was in 1879 that the Corps of Engineers received authorization for the construction of outer breakwater structures and the dredging of the harbor bottom. Further legislation in later years allowed for construction of seawalls, another breakwater, and a small-boat harbor.

2.625 U.S. Highway 61 through Grand Marais has an historic tradition also. It began as an Indian trail, and was later designated the Dog Trail from 1856 to 1900 because dog sleds followed this route to haul mail from Duluth to Canada. Around 1900 the trail was widened and improved as the Lake Shore Road, until in 1920 it became State Highway 1. In 1930, it became U.S. Highway 61.

2.626 Grand Marais is gradually changing from a logging-fishing town to a tourist mecca. The trend began as early as 1878, when cruising the North Shore was popularized by articles in national magazines such as Harper's. The trend accelerated in 1930 with the designation of a U.S. highway route through the town. While many loggers still work the region and a few fishermen are still around, the village is becoming more and more dependent upon the tourist dollar.

2.630 Social Characteristics. Grand Marais is administered by the mayor-village council system of government. Covering an area of 1,661 acres, or 2.6 square miles, Grand Marais is the county seat and commercial center of Cook County. The total population of Grand Marais was unchanged from 1960 to 1970 remaining at 1,301 persons. However, this is not likely to recur over the next decade. Grand Marais is sure to experience substantial growth by 1980. The county's population in 1970 was 3,423, up 1.4 percent from 3,377 in 1960.

2.631 The Grand Marais labor force of 618 persons in 1970 exhibited an unemployment rate of 3.0 percent, well below the national average. Median income was $9,000 per annum with 5.9 percent of families having income below the poverty level and 20.6 percent with income of $15,000 or more.

2.632 Although there are many sources of employment in Grand Marais, the number of harbor-related jobs is small. Grand Marais once served as a shipping point for the logging industry. At one time, virtually all of the total commerce for Grand Marais Harbor consisted of logs and pulpwood. Commerce reached a peak of over 78,000 tons in 1958, then diminished somewhat. However, in 1972, Consolidated Papers, Inc., ceased log shipments from the harbor, reducing levels of harbor lumber commerce to almost nil. Although Grand Marais remains an important timber production area, logging activity has declined in importance. Commercial shipping activity in Grand Marais Harbor is now limited predominantly to a small fish industry, which is also on the decline.

2.633 The Minnesota Department of Natural Resources records indicate 13 commercial fishing licenses issued to persons with Grand Marais addresses. There are presently, however, just two commercial fishermen utilizing the harbor, one of whom fishes only part-time. The remaining 11 either are inactive or operate from alternate landing points in the Grand Marais area. The harbor also provides employment for two persons both of whom operate wholesale and retail fresh fish outlets. There is no harbormaster at Grand Marais, and there is no recreational boating activity-related employment, although the campground supervisor spends some of his time administering the marina. There is one Coast Guardsman working at the Grand Marais station.

2.634 Some organizations are indirectly dependent on the port for some part of their business. These include firms that sell fish as well as firms that sell goods or services to recreationists using the harbor. Not only does the harbor add to the scenic appeal of Grand Marais, but it also serves to attract boaters to the port, who purchase supplies and may patronize motels, restaurants, gift shops, and the like. There are three boat dealers and one fishing tackle-bait shop at Grand Marais, whose sales are partially attributable to the proximity of the harbor. Seaplane rides are available at Grand Marais also. The amphibious plane is normally kept at a nearby inland airport, but lands in the harbor and taxies to the city pier to take on passengers.

2.635 Tourism is by far the foremost industry at Grand Marais. In fact, Grand Marais is considered to be the heart of the North Shore tourist region. Its harbor is an especially scenic harbor with pine-covered hills rising in the background. Many tourists walk out upon the breakwaters, especially the east one, to get a close view of the lake and the waves breaking against the wall. A forested peninsula juts eastward from the southeasternmost point of the harbor and is a favored spot for sight-seers and photographers. On the northwest side of the harbor is a municipal campground owned and operated by the village of Grand Marais. The proximity of the boat launch ramp and marina makes the campground particularly attractive. The Grand Marais area is also extremely scenic with unique opportunities for outdoor recreational activities close at hand. The Gunflint Trail, leading to the finest canoeing waters in the United States, starts at Grand Marais, bringing many canoeists to this area. Grand Portage National Monument is only some 45 miles north. Fishing and boating are popular at inland lakes as well as on Lake Superior. Sight-seeing, hiking, or looking for agates and thompsonite on Lake Superior beaches are other activities pursued in the area. In the fall, hunters flock to the area in search of deer and other game. Winter sports are increasing in popularity, especially snowmobiling and cross-country skiing, and these activities draw people to Grand Marais also. Previously the tourist activity was confined almost exclusively to the summer months, but growing popularity of winter sports has altered this. Tourist business in Grand Marais is likely to increase in the next few years, due to several new developments in the region that will likely increase tourist traffic. The new established Voyaguers National Park will encompass much of the present Boundary Waters Canoe Area, and will probably increase the number of visitors coming to the area both from within the state and from other states and provinces. The Apostle Islands National Lakeshore will no doubt increase recreational boating activity in Western Lake Superior, with many visitors to the National Lakeshore likely to extend their visits to include the North Shore, Isle Royale, etc. Also, a large commercial recreational development is being planned for the Grand Portage Indian Reservation, north of Grand Marais, to include a Hilton Hotel. Most visitors to that development will travel via recreational boats or via U.S. 61, with stopovers at Grand Marais likely in either case. Presently the Minnesota Department of Economic Development lists 46 resorts, motels and hotels in the Grand Marais area.

2.636 There are approximately 75 businesses providing varied and diversified employment as well as a bank, a 70-bed hospital, the Cook County High School located in Grand Marais and the Grand Marais Elementary School. The Cook County School District alone employs 83 personnel, most of whom live and work in Grand Marais. Governmental units and agencies employing Grand Marais residents include the U.S. Coast Guard, the U.S. Forest Service, U.S. Post Office, Cook County; Cook County School District, Village of Grand Marais; U.S. Customs and Immigration; the U.S. National Park Service; Minnesota State Division of Forestry, Minnesota Division of Game and Fish, Minnesota Highway Department Maintenance Garage, and the Minnesota Highway Patrol.

2.640 Transportation. Until the trail from Duluth became a State highway in 1920, th primary mode of transportation to Grand Marais for both persons and goods was water transport. Now, however, commercial shipping at Grand Marais is almost non-existent. Highway 61 is the major route by which traffic enters and leaves Grand Marais. The Gunflint Trail is the only other major road entering the village; this 58-mile roadway ends near Saganaga Lake near the Canadian border. Grand Marais is served by one common carrier motor freight line. Two Greyhound bus trips are made daily into Grand Marais also. The Devils Track Lake Airport lies about five miles outside town. This is a seasonal landing strip for small planes. No scheduled commercial flights land there, however. A seaplane is available for charter flights from Grand Marais Harbor. The only other airport in Cook County is a privately owned one at Tofte. There has never been a railroad line at Grand Marais. The only rail line in Cook County stretches from Hoyt Lakes (St. Louis County) to Taconite Harbor, and is used exclusively to haul iron ore and concentrate.

2.700 Future Environmental Setting without the Project. Without a maintained project, storm generated waves will continue to scour the outer harbor bottom, picking up gravel and rockand tossing the material over the inner breakwater thereby filling up the inner small boat basin and rendering it useless. The various breakwaters would eventually be pounded to pieces by storm wave activity. After one or two bad storm seasons the structures would deteriorate to the point where they would no longer serve their function of harbor protection and aids to navigation.

2.701 No project would essentially put an end to the usefulness of the Grand Marais Harbor as a small boat harbor and fishing craft port. Because of its pocket nature and natural depth its value as a harbor-of-refuge would remain, although without the Corps breakwaters even this funciton would be seriously impaired. Besides the loss of the protection afforded by the harbor, no project would result in a loss of various jobs associated with operation of the small marina, and the harbor related small commercial fishery.

3.000 Relation of the Harbor to Future Land Use

3.100 Although Grand Marais' population of 1,301 persons has remained unchanged from 1960-70, it is likely to experience substantial growth by 1980. While logging activity in Grand Marais is on the decline, the development is gradual and likely to stabilize near present levels with neither large increases nor decreases in the number of persons invloved. The same is expected of commercial fishing. With no significant commercial shipping anticipated in the near future, harbor activity at Grand Marais is now and will continue to be almost exclusively recreational in nature. However, the recreational boating activity will no doubt increase steadily, reflecting increased boat traffic on Western Lake Superior as a result of developments in the Apostle Islands and Grand Portage areas. Also, rising incomes have enabled more and more people to afford the kind of expenditure required to obtain a boat suitable for Lake Superior cruising. With the local economy firmly based on tourism and with tourism on the steady rise as Americans and Canadians have more time and more money for leisure activities, Grand Marais with its high quality of tourist facilities is in an excellent position to capitalize on this opportunity. As mentioned earlier, the harbor is a definite asset to Grand Marais' desirability as tourist spot.

4.000 Probable Impact of the Proposed Action on the Environment

4.100 General. The U.S. Army Corps of Engineers uses the crane barge MARKUS (DKS-20) attended by the tug DULUTH and the tender FAIRCHILD

(CLEVELAND) as well as the derrick barge COLEMAN attended by the tug LAKE SUPERIOR and the tender BAYFIELD for dredging and structure maintenance in Grand Marais Harbor. Depending upon maintenance work to be accomplished there would be anywhere from five to twenty-six crew members from the various pieces of equipment in Grand Marais Harbor at any one time. The crew or crews are in the harbor for a 2 to 3 week period every 3 to 4 years. All of the floating equipment associated with the process of structure maintenance consume various quantities of bunker and diesel fuel. Because of the highly variable nature of time and equipment in Grand Marais Harbor maintenance activity, no attempt has been made to determine quantities of fuel burned while in the harbor. The MARKUS (DKS-20), the DULUTH, the FAIRCHILD (CLEVELAND), and the various other motors consume an average of 9,850 gallons of diesel fuel each year. The COLEMAN, the tug LAKE SUPERIOR and the BAYFIELD consume an average of 123,800 gallons of fuel each year. Only a small portion of this fuel is expended in Grand Marais Harbor during those years the team is engaged in structure repair. Maintenance is conducted as necessary. Certain amounts of engine and moving parts lubricating oils and grease may reach the water directly as a result of equipment submersion, or indirectly as a result of barge, tug, or tender bilge pumping. Although all reasonable care is maintained to prevent oil and grease from entering the water, an oil slick may occur in the vicinity of the operating equipment. Short term impacts to air quality may result as bunker fuel from the boilers aboard the COLEMAN, and diesel exhaust from the diesel motor aboard the DK-20, and the diesel motors aboard the tugs and tenders must be vented into the open air.

4.200 Impacts of Breakwater Maintenance. Rock for breakwater repair used to be found along the north and south shores of Isle Royale; however, the Corps now buys rock from trap-rock quarries near Duluth for use in structure repair work.

4.210 Noise. A certain amount of noise is associated with the operation of motors, pistons, winches, etc. Little of the noise associated with the equipment is audible beyond a 100-yard distance. Most structure repair also takes place during normal "working" hours, and noise, therefore, is a relatively insignificant, short term impact.

4.220 Activity Related Congestion. The repair barge, with its tug, tender and associated equipment may occasionally cause a minimal amount of channel blockage as it moves to and from repair sites within the entry. While at the repair site at the breakwater, the equipment is tied up to the breakwater out of navigation channels and should not contribute to harbor congestion.

4.230 Biological. Permanent structures, such as the breakwaters at the Grand Marais Harbor entry and inner harbor, introduce concrete, rubble and rock to the water where none existed previously. They also tend to exert an independent effect on the kinds and number of organisms, both plant and animal, that live in association with the structures. Breakwaters along a relatively unsheltered coastline not only provide an area of calm water for navigational purposes, but also provide a relatively calm and sheltered habitat for species which would normally not be found in this area. Increases in plankton, and benthic species can be expected in areas of reduced wave force. As the habitat and nutrient levels increase, increases may also occur in numbers of fish present. The net result of increased species and habitat diversity will be an increase in biomass for the harbor. Many sport fishermen take advantage of the increased fish population and existence of the breakwater as a platform for off-shore fishing without a boat.

4.240 Chemical. Although the potential for long-term leaching of inorganic constituents from the structures exists, since the structures are essentially constructed of rock and concrete, the impact is considered to be similar to the normal erosion and leaching of native rock shorelines at other points along Lake Superior. Thus the potential chemical impacts of the breakwater materials are considered to be minimal.

4.250 Current and Wave Alteration. Both the east and west entry structures tend to channelize currents entering and leaving the harbor. They act to break, or moderate the effect of storm driven waves and to provide a relatively slack water area for boat passage. However, when storm winds are directly in line with the breakwater, storm waves tend to "funnel" into the entry channel creating a hazardous navigation situation. This effect is somewhat mitigated by the inner small boat basin breakwater in the northwestern corner of the harbor.

4.300 Impacts of Dredging. Bottom sediments are scooped from the harbor bottom and placed in barges which are moved by tugs to dump sites. Since 1879 the Corps of Engineers has removed 487,808 cubic yards of sediments to maintain an 8 to 20-foot depth within the Grand Marais Entry and Harbor. Deeper dredging in entry channels is done for a combination of two reasons: One is to reduce the possibility of shoaling at the entry caused by wave and littoral current sediment deposition; another is to allow boats and ships safe depths for entering or leaving a harbor during a storm. Boats caught in the "valley" between storm wave "peaks" could scrape bottom in a shallow entry channel.

4.310 Turbidity. The dredges DKS-20 and COLEMAN operate by dropping their clam-shovel buckets into the bottom and obtaining a scoop of bottom sediments. The act of dredging creates a certain amount of turbidity (muddied or sediment clouded water). Lifting a load of sediments out of the water also causes turbidity as "mud" washes out of the dredge bucket.

4.311 The act of dredging redistributes and resuspends the finer sediment material found at the sediment-water interface. The layer of fine, easily disturbed sediments may therefore be increased in the adjacent undredged areas, representing the original state plus some of the material stirred up by dredging.

4.312 The amount of turbidity is related in part to the nature of the bottom sediments being dredged. Sand and gravel create relatively little turbidity, while clay and light organic "muck" will create more turbidity. Generally, however, the "plume" of dredge-induced turbidity is of relatively small extent and short duration. Sand and gravel such as that found at Grand Marais create relatively little turbidity.

4.313 Although specific effects of turbidity are frequently unknown, generic effects are known and can be discussed. The most obvious effect is a reduction of light penetration into the water. Reduction in light penetration of relatively short duration (in the nature of minutes) will, however, have relatively little effect upon the light requirements of sensitive organisms.

4.314 More subtle (and, therefore, more difficult to accurately determine) effects are those produced upon aquatic life and water quality in the area of the operating equipment. Turbidity clouds and associated release of oxygen-consuming nutrients, especially where dredging of organic sediments is being conducted, can be expected to reduce the dissolved oxygen level of the surrounding water, temporarily driving off higher forms of sport fish.

4.315 Turbidity directly effects resuspension, redistribution and indirectly effects oxidation or reduction of various chemicals. Many of these substances are toxic to life forms, although it is as yet not fully known to what extent turbidity caused by dredging influences toxicity concentrations.

4.320 Water Contamination. The DULUTH associated with the MARKUS (DKS-20), the LAKE SUPERIOR and the COLEMAN are equipped with sanitary holding tanks for containment of onboard generated wastes. A certain amount of water quality impairment occurs as a result of dredge-induced turbidity, discussed above, and oil and grease from bilge pumping and equipment operaiton. Oils and grease used to lubricate operating engine and other parts of the dredge and its attendant equipment reach the water in small quantities resulting in a noticeable slick on the water in the immediate area of the operating equipment.

4.330 Noise. Noise associated with the operation of the dredge is substantial. The use of large mechanical equipment results in noise associated with the motors, winches, and the raising and lowering of the dredge bucket. This noise impact is relatively short lived, being associated only with the act of dredging during "normal" working hours.

4.340 Activity Related Congestion. The act of dredging involves the location of a dredge, scow, barge, and other large pieces of equipment directly in the basin or channel. As such, they present a navigational obstacle by their presence. In Grand Marais these pieces of equipment do not cause significant congestion.

4.350 Chemical Impact. Sampled sediments in the Grand Marais Harbor contain high (in excess of EPA guidelines) concentrations of organic matter nutrients, oil and grease and some heavy metals. Dredging, with its concomitant disturbance of bottom sediments, causes a temporary resuspension of some of the fine particles. The impact of turbidity has been discussed in paragraphs 4.310 - 4.315.

4.351 In addition to resuspending physical particles, dredge-induced turbulence also brings soluble chemicals from the sediments into solution in the water. In warmer and more eutrophic waters this addition of nutrients and chemicals may have a direct impact in causing temporary algae blooms. In the colder Lake Superior waters, however, blooms have not been observed. The increased concentration of available nutrients would be expected to support large plankton populations but not to the extent that nuisance blooms would occur.

4.352 The introduction of chemicals into solution is considered to be one of the unavoidable impacts of dredging utilizing currently available equipment.

4.360 Biological Impacts. Dredging to remove accumulated sediments from harbor channel and basins has an effect upon aquatic ecology. The surface area of the sediments has an accumulation of benthic (bottom dwelling) organisms. Dredging removes not only the sediments, organic matter, nutrients and other materials associated with this surface layer, but also the benthic organisms. The new layer of sediments exposed after dredging will have less organic matter and fine materials and few benthic organisms.

4.361 Habitat Alteration. When a totally new environment (habitat) is exposed by dredging, a different benthic community would be expected to develop. Dredging involves exposure of sediments which have not been exposed to the aquatic environment. This might occur when new harbor areas are dredged.

4.362 The rate at which a benthic community reaches equilibtium after dredging operations has not been documented. Individual organisms may, in fact, return relatively rapidly; but the symbiotic relationships between various species suggest that a transitional benthic community will be established shortly after dredging and that it will take a period of years before a benthic community reaches its former state. Harbor maintenance which requires periodic dredging would preclude permanent re-establishment of a stable benthic community.

4.370 Organic Matter Removal. The material at the sediment-water interface is frequently high in both organic and chemical components. Removal of the organic material by dredging is expected to reduce the oxygen demand on the water at the interface. The waters of Lake Superior are normally high in dissolved oxygen throughout the year. It is, therefore, unlikely that changes in the oxygen demand of areas in the Grand Marais Harbor will have a significant impact on fish habitat.

4.400 Probable Impact of Dredge Disposal. Presently, the Grand Marais Harbor is unclassified as to its pollutional status. Until EPA does classify the harbor, the Corps may utilize both open-water and on-land disposal methods. However the disposal method for each specific operation must be planned in coordination with EPA and will be subject to its approval. In December 1974, the Corp requested EPA to re-analize and classify Grand Marais Harbor.

4.401 Regardless of the disposal method utilized, certain impacts remain relatively the same. A certain amount of diesel and gasoline exhaust is produced by the various pieces of equipment in the disposal procedure, although no excessive environmental stress has yet been seen to have occurred from this normal practice. Some water contamination may result from oil or grease reaching the harbor waters through normal operation and submersion of lubricated machinery in the harbor. While a certain amount of noise associated with disposal equipment and activity will occur, the operation is conducted during "normal" working hours and thus should present no special problems. The open lake disposal site and both proposed disposal areas for temporary stockpiling of the dredged material are located at some distance from permanent human habitation further minimizing any noise effects. While beach nourishment work would occur within close proximity of a motel, resulting in a possibly undesirable atmosphere for the tourists, the activity involved would last for a short time only. The act of disposal would result in the movement of tugs, barges, and other pieces of equipment which may create a navigational obstacle and cause some congestion in the harbor. A certain amount of diesel fuel is expended to operate the equipment necessary for dredging procedures.

4.410 Open Water Disposal. Open lake disposal brings potentially detrimental materials, presently isolated within the sediments of the harbor temporarily into intimate contact with the high quality water of the open lake. The degree of impact on water quality depends on the amount of detrimental material in the dredged sediment. Short-term changes in physical water quality in or near the dump zone may result from sediment particles being suspended in the water. Short-term localized sediment clouds in the water may have a temporary effect upon fish in the area.

4.411 Disposal of highly organic dredge material in an open water dump zone can result in organic sediment trails causing a localized relatively short-term decrease in dissolved oxygen as the (probably) anaerobic sediments begin aerobic decay in the highly oxygenated open lake water. This situation would result in a short-term repelling of higher forms of open lake fish until the turbidity has cleared.

4.412 Turbidity clouds would disperse heavy metals, which had been bound with the sediments, throughout the disposal area. At present it is known that heavy metals are toxic to life forms in varying ways and degrees. But it is not known in each case how heavy metals in dredged material may affect harbor or open lake ecology. The heavy metals may be picked up by plankton and subsequently passed from organism to organism in a "food chain". These metals can be carried via minnows and larger fish to areas outside the disposal zone. Heavy metals may, thus, be transferred, through commercial or recreational fishing, into the food chain of higher organisms. Since the levels, concentrations, and effects of metals within organisms increase along the food chain, the adverse impact likewise increases in severity as the metals move up the chain.

4.413 Open lake disposal, with its concomitant resuspension of sediment material, would increase the concentration in the water of whatever chemicals are found in the dredged sediment, resulting in a detrimental effect on water quality in the disposal area. Such an impact is dependent upon the quantity of these chemicals in the disposed material. Nutrients released in the water as a result of dredged material disposal may, on the other hand, spur an increase of planktonic growth which in turn attracts higher species of sport and commercial fish.

4.414 An additional impact of open water disposal would be the burial, en masse, of benthic organisms under the load of deposited material. Available evidence suggests, however, that where dredged sediment is disposed of in an area characterized by a bottom sediment similar to the dredged material, recolonization will occur with relative rapidity.

4.415 Dredged material deposited inthe open lake represents a waste of a valuable natural resource.

4.420 Beach Nourishment. Beach nourishment would effect utilization of the sand, gravel, and stone dredged from the harbor in a practical manner, representing a recycling of a valuable natural resource. However, as the dredged material would be dumped just offshore at a depth of approximately 8 feet, the impacts of this disposal method would be much the same as those of open lake disposal, discussed above. This method of disposal would subject whatever potentially detrimental materials contained in the sediments to redistribution by waves and long shore currents.

4.430 On Land Disposal. Dredged material to be utilized as a construction resource in public highway construction and repair projects would be initially placed on land at one or two temporary sites.

4.431 No biological systems would be affected by this proposed method of disposal. Neither of the two sites have any significant fish or wildlife value. Both temporary disposal areas are presently stony beach areas devoid of significant vegetation. Care, however, should be exercised if temporary disposal in the park area is utilized, to prevent sand and stone piles from covering bushes and shrubs in the area.

4.432 Sediment analysis done on Grand Marais Harbor indicates that the sediments in the project area of the harbor contain high (in excess of EPA guidelines) concentrations of organic materials and some metals, although the samples taken have been insufficent for EPA to classify the harbor. Short-term storage of the dredged material on the shoreline would allow leaching of certain chemicals back into the harbor. The possibility of leaching can be reduced, although not eliminated, by allowing stockpiling near the harbor for only short periods of time (days). Even so, the dredged material would be subject to any rain or storm that might occur during the storage period which would result in extensive leaching or even washing away of large amounts of the material into the harbor. Stipulations placed upon the use of the dredged material, preventing its use as fill in or near marsh areas or in areas where rain or meltwater could carry possible contaminants immediately into a stream, river or lake, would further reduce the effects of leaching. The adverse effects are considered minimal when compared to the benefits to be realized as a result of the sand, gravel, and stone resource utilization.

4.500 Socioeconomic Impacts Related to Operation and Maintenance Activities. Until the cessation of the pulpwood shipping industry in 1972, the major socioeconomic impact of Corps of Engineers maintenance operations in Grand Marais Harbor was that dredging enabled deep draft tugs to enter the harbor to haul away rafts of pulp logs. This provided a number of jobs in activities related to cutting pulpwood, transporting it to the harbor, loading it into raft form, and transporting it to Ashland Harbor, Wisconsin.

4.510 Presently, the major socioeconomic impact is that continued operation and maintenance will enable recreational craft and commercial fishing vessels use of the harbor. The major source of employment for Grand Marais residents is the tourist industry. As mentioned earlier the harbor compliments the tourist industry, not only because it is scenic, but also because it serves to attract boaters to the area who take advantage of the tourist facilities at Grand Marais. With substantial recreational developments taking place in the area, such as Voyaguers National Park, a hotel-resort complex at Grand Portage and a new marina at Knife River Harbor. increased volumes of tourists and recreationists along with concomittant increased economic activity may be expected. Not to be ignored is the amount of money spent directly in the community for groceries, supplies, spare parts, entertainment, and the like, while maintenance activity is underway at Grand Marais. It is estimated that when the COLEMAN is operating in Grand Marais, approximately $1,200 is spent by the crew per week in the local community.

5.000 Probable Unavoidable Adverse Effects

5.100 Breakwaters. The potential exists for long-term leaching of inorganic constituents from the breakwaters. However, since the structures are essentially constructed of rock and concrete, the potential impacts of this material are considered to be minimal and similar to those resulting from normal erosion and leaching of native rock shorelines at other points along Lake Superior.

5.101 When storm waves are directly in line with the breakwaters, they tend to "funnel" into the entry channel creating a hazardous navigation situation. This effect is somewhat mitigated by the inner small boat basin breakwater in the northwestern corner of the harbor.

5.200 Dredging. The act of dredging in the harbor causes a certain amount of disruption to the normal harbor and port function . The dredge, scow, tug and tender occupy physical space and, in confined areas such as the small boat harbor, present something of a navigational hazard or barrier to free and normal use of the harbor.

5.201 The physical act of digging a hole in the harbor bottom under water causes several unavoidable effects, the most obvious of which is turbidity. (See discussion of turbidity, paragraphs 4.310-4.315).

5.202 The most ovvious effect of turbidity is the reduction of light penetration into the water. In most cases light penetration reduction is of relatively short duration and, therefore, could be presumed to have no long term effect upon the ecosystem.

5.203 Turbidity clouds and the associated release of oxygen consuming nutrients, especially where organic sediments are being dredged, can be expected to reduce dissolved oxygen in the surrounding water and thus discourage the presence of higher forms of sport fish. On the other hand, the same nutrient releases may over a period of time actually result in an increased biomass and perhaps greater species diversity; however, it may be expected that ultimately the area will return to an ecological equilibrium.

5.204 Turbidity also effects resuspension, redistribution and related solubility-accelerated oxidation or reduction of various oils and grease and of heavy metals such as lead, zinc, mercury and copper. All of these substances are toxic to life forms, although it is as yet not fully known to what extent dredging-induced turbidity influences the toxicity concentrations of these substances.

5.205 Aside from turbidity-influenced effects, the physical act of digging and disrupting the habitat of various benthic dwelling organisms must be considered as one of the unavoidable effects of the dredging operation. Fish are mobile and are able to swim away from the dredge scoop or clam-shell. Benthic organisms such as bacteria, fungi, worms, mollusks, insect larvae and crustacea must be considered as relatively immobile and, therefore, subject to being dredged up along with their habitat.

5.300 Disposal.

5.310 On Land Disposal. Although stockpiling of the dredged material on the lakeshore prior to its being hauled away by local contractors for use in road repair and construction is to be of a temporary nature, the dredging project generally lasts 2 to 3 weeks. During this time there could be a continual daily dumping of dredge material on the shore. The potential thus exists that rain, meltwater or some other natural or human activity could carry possible contaminants back into the lake before removal of the sediment. However, it is anticipated that no long-term detrimental effects would be associated with the proposed temporary placement of dredged material on the shore.

5.320 Open Lake Disposal. Open lake disposal could introduce potential contaminants in dredged sediments into intimate contact with the high quality water of the open lake, thereby impairing its quality. Turbidity, induced during disposal of material, could cause a dispersion of heavy metals, resuspension of fine particles, and the introduction of soluble chemicals from the sediments into the water. Disposal of highly organic dredge material can result in a localized, relatively short-term drop in dissolved oxygen temporarily driving off some forms of sport fish.

5.321 An unavoidable effect of the open water type of disposal is the burial, en masse, of benthic organisms by suddenly unloading sediments from a barge. Again though, the available evidence suggests that where sediment is disposed of in an area characterized by a bottom deposit similar the dredged material, recolonization will occur with relative rapidity.

5.330 Beach Nourishment. If the dredged material is to be dumped ott shore in about 8 feet of water, the impacts of this disposal method would be similar to those discussed above under open lake disposal. While the potentially detrimental material would not be introduced to the high quality water of the open lakes, it would be subject to redistribution by waves and long shore currents.

6.000 Alternatives for the Proposed Action

6.100 Disposal Alternatives

6.110 Open Lake Disposal. Although sampling and analysis of Grand Marais Harbor has indicated various contaminants found in the bottom sediments are in excess of the EPA criteria, the harbor has not been classified by EPA as being polluted for the time being. The possibility exists, therefore, that open lake disposal of material dredged from the Grand Marais Harbor could be legally undertaken.

6.111 The potentially detrimental materials associated with the Grand Marais Harbor sediments are essentially isolated with the sediments because of the configuration of the natural pocket harbor. Open lake disposal would bring these presently isolated materials into intimate contact with the high quality water of the open lake. Such intimate contact between the contaminants and the Lake Superior water could result in a certain degree of water quality impairment as well as an adverse effect upon the aquatic ecosystem.

6.120 Beach Nourishment. Although beach nourishment would utilize the sand, gravel and stone dredged from the harbor in a wise manner from the point of view of resource utilization, this method of disposal could introduce potentially detrimental materials contained in the sediments to the inshore waters and to the open lake through redistribution of the sediment by waves and longshore currents.

6.130 Temporary On Land Stockpiling. Proposed use of the sand, gravel and stone dredged from the Grand Marais Harbor as a road construction and repair material, while allowing some leaching, represents a constructive disposal method. Stipulations should be included which would, however, prevent use of the material immediately in or adjacent to marsh areas, streams, rivers or lakes in order to prevent immediate runoff and leaching of contaminants back to public waters.

6.140 Confined or Diked Disposal. Although on-land or confined disposal of dredged material is the usual recommended disposal alternative for cases of polluted sediment, it is, in this instance, economically unfeasible. The amount of material to be dredged in future maintenance is small and the municipality would be able to utilize that amount in area construction projects.

6.200 No Project Alternative. The no project alternative would, in this instance, be questionable since it would eventually put an end to the usefulness of the Grand Marais Harbor as a small boat harbor and fishing craft port. Because of its pocket nature and natural depth its value as a harbor-of-refuge would remain, although without the Corps breakwaters even this function would be seriously impaired. Besides the loss of the protection afforded by the harbor, no project would result in a loss of various jobs associated with operation of the small marina, and the harbor related small commercial fishing.

7.000 Relationship between Short-Term Uses of Natural Environment and Maintenance and Enhancement of Long-Term Productivity

7.001 The propriety of Corps of Engineers maintenance activities in Grand Marais Harbor must be weighed against the potential damage incurred to any part of or all of the human life support system - the biosphere - thereby guarding against the short-sighted foreclosure of future options or needs. Past, present and proposed actions and their associated detrimental and beneficial impacts must be considered not only in relation to the specific harbor area affected but also to the greater area and public served by the project.

7.002 Army Corps of Engineers maintenance activities in Grand Marais Harbor are conducted by Congressional authority in response to expressed and implied public need for continued small craft navigation and safety requirements within the project area. Breakwater repair and inner basin dredging is performed on a periodic basis as needed, in response to changing harbor use patterns and in response to storm-generated breakwater damage and basin shoaling.

7.003 In pursuit of the requirements for harbor maintenance. some localized short term expenditures of funds, manpower and natural resources have occurred. Localized short term disruptions of the benthic biological community have occurred; however, no apparent long term damage to any ecosystem has resulted from past Corps dredging or structure maintenance within the harbor. Future maintenance dredging and structure repair, if conducted essentially as in the past, should not constitute a long term detrimental effect upon life styles, land use patterns or ecosystems in the Grand Marais Harbor area.

7.004 Some localized short term releases of potential contaminants to the open waters of Lake Superior have occurred in the past during disposal of material dredged from the harbor; however no apparent long term damage to any ecosystem has resulted from past on-land or open lake dredged material disposal methods. Most of the material deposited in the open lake in the past has been in the nature of gravel and cobble characteristic of the beach material in the area and wood chips from past logging operations within the harbor. Open lake disposal of gravel and cobble dredged from the harbor represents a waste of a valuable natural resource. Open lake disposal of the wood chips has probably not been of a magnitude which would have degraded the open lake system along the North Shore due to the extreme cold temperatures in the open lake which would tend to inhibit bacteria. Evolving knowledge and appreciation of the potential long term cumulative detrimental effects upon ecosystems and water quality resulting from potential contaminants contained in the dredged material requires consideration and application of new disposal methods. If utilization of the dredged material as a construction resource is to be the future disposal method, the natural environment or associated land, harbor or lake ecosystems should not be detrimentally affected. If open lake disposal or beach nourishment are to be continued the impacts will be much the same as they have been in the past.

7.005 Corps maintenance activity and the periodic expenditure of funds, manpower, and natural resources associated with that activity have permitted the continued use of Grand Marais Harbor by those individuals who rely on the harbor for their livelihood, for their recreation and for their safety.

7.006 Continued Corps maintenance of the Grand Marais Harbor, while resulting in irretrievable short term uses and commitments of resources and temporary disruption of harbor benthic species within the project area, will allow the existence of harbor-related land use and life style options for present and future generations in the Grand Marais community and surrounding North Shore area.

8.000 Irreversible and Irretrievable Commitments of Resources

8.100 Breakwater Maintenance. Breakwaters at the Grand Marais entry and inner harbor small boat basin are constructed of pilings, rock and concrete. All of the materials that go into either the construction or maintenance of any Corps of Engineers harbor structures may be considered permanently and irretrievably committed. All fuels and lubricating oils used by construction and maintenance machinery also constitute irretrievable commitments of natural resources.

8.200 Maintenance Dredging. The operation of dredging equipment, tugboats, tenders and other maintenance craft results in consumption of various quantities of petroleum products in relation to the frequency and duration of the maintenance dredging operation. All fuel consumed during maintenance dredging operations constitutes an irretrievable commitment of natural resources.

8.300 Dredge Material Disposal

8.310 In the Open Lake. Past operations have disposed of approximately 488,000 cubic yards of sand, gravel and stone dredged from the harbor over the life of the project. Much of this material has been disposed of in the open lake and, therefore, represents the irretrievable loss of a valuable natural resource.

8.320 As Beach Nourishment. If the harbor is classified "unpolluted" the proposed use of dredged material as beach nourishment (replacement of beach sand, gravel and stone removed by storm waves and longshore currents) would represent a wise recycling of a valuable natural resource, as well as a replacement of real property and associated lakeshore land values.

8.330 On Land Temporary Stockpiling. At various times in recent years, sand, gravel and stone dredged from the harbor have been utilized by local construction firms in maintenance and construction of public roads in the Grand Marais area. Although this represents an irretrievable commitment of resources, it also represents a wise utilization of resources .

8.400 Long-Term Commitments of Resources. Certain irreversible and irretrievable commitments of resources associated with Grand Marais Harbor maintenance must be viewed in light of the long term public good, public need and public safety afforded by a harbor in this location.

8.401 Corps of Engineers maintenance activity in Grand Marais Harbor permits both recreational boating and commercial fishing activity to be pursued by those persons who have chosen Grand Marais Harbor as their home port. Of primary importance, however, is that continued commitments of resources will assure the existence of a necessary harbor-of-refuge along Minnesota's North Shore. The importance of the existence of harbors-of-refuge around the shore of Lake Superior should not be underestimated by those unfamiliar with Lake Superior's storm fury, and associated commitments of resources represent a wise public investment.

9.000 Coordination

9.001 This report was drawn partially from an environmental impact assessment prepared by National Biocentric, Inc., under contract with the Corps of Engineers. Several planning and coordination meetings have been held th s far in the program for an assessment of Corps harbor operation and maintenance activities. Representatives of the Corps of Engineers; National Biocentric, Inc.; the subcontracted University of Minnesota, Duluth; University of Wisconsin, Superior; and Michigan Technological University, Houghton, have been in attendance at meetings held during October 1972 at Ashland, Wisconsin; January 1973 at Superior Wisconsin; March 1973 at Duluth, Minnesota; May 1973 at St. Paul, Minnesota; and August 1973 at Houghton, Michigan. During the weeks 9-13 and 6-9 of July, representatives of National Biocentric, Inc.; the Corps of Engineers, St. Paul District and Duluth; the Environmental Protection Agency; the Bureau of Sport Fisheries and Wildlife; the Minnesota Pollution Control Agency; the Minnesota, Wisconsin and Michigan Departments of Natural Resources; as well as local administrative officials and interested parties, participated in a tour of all harbors on Lake Superior which are within the jurisdiction of the St. Paul District of the Corps of Engineers. The purpose of the tour was to familiarize the representatives of interested federal, state and local governments and of the contracting agencies who were carrying out technical studies on specific harbors with all of the harbors and the problems involved, in dredging, disposal and general maintenance of such harbors. It was hoped that as a result, the assessment parameters would be better understood by all and that a coordination of effort might better be achieved. In addition to the meetings and tours mentioned above, staff and consultants have met informally as the need arose to coordinate and assess the data. The National Biocentric, Inc., staff and its consultants have visited each of the harbors and their associated communities for the purpose of conducting the socio-economic-historic interviews and assessments. At such times they have also met with the representatives of the local business groups with industry and with local governments. (See exhibit 14, pages A-20 - A-27, for letters of historical and archeological coordination.)

10.000 Conclusions

10.001 Based on the information contained in this assessment I conclude that the continued operation and maintenance of Grand Marais Harbor is important to the health, safety, and social well-being of the residents of the local area and other persons utilizing the facility as a harbor-of-refuge.

10.002 The adverse impacts of operation and maintenance activities are generally short-term in nature and the social benefits resulting from the project far outweigh these short-term effects. However, in order that the Grand Marais project remain desirable, and to reduce the potential environmental impacts, consideration should continue to be given to minimizing the impacts on fish and wildlife resources during all phases of maintenance and to reducing the return of polluted materials to the water following dredging and disposal.

10.003 The Corps of Engineers has requested the Environmental Protection Agency (EPA) to further analyze Grand Marais Harbor and subsequently assign the harbor a pollutional status.

10.004 While the harbor remains unclassified the proposed disposal method for each specific operation will be submitted to EPA for approval. No disposal activity can be undertaken without EPA's approval.

10.005 Whenever dredged material is to be used for road construction and maintenance, stipulations should be made which would prevent the use of such material immediately in or adjacent to marsh areas, streams, rivers, or lakes in order to prevent immediate runoff and leaching of contaminants back into public waters. Whenever temporary stockpiling of dredged materials occurs, effort should be made to remove the material as quickly as possible.

10.006 Attention should continue to be given to preventing, controlling, and removing any fuel spillage or oil slicks caused by dredging and harbor maintenance activities. Efforts should continue to be made to avoid spillage of sediment back into the harbor during dredging, loading and unloading of scows, cleaning of scows, and related activities.

10.007 Attention should continue to be given to scheduling dredging so that it does not coincide with fish spawning in the harbor.

10.008 Any historical and archeological finds made during dredging and harbor maintenance activities will be recorded and preserved.

10.009 Public access and recreational opportunities for fishermen, bird watchers, photographers, and other users of the breakwaters, and adequate safety precautions and equipment will be afforded.

10.010 The proposed action will not result in the displacement of any persons or in the loss of any known cultural, natural, historic, or archeological resources.

10.011 The environmental review by this office has indicated that the proposed action will not have a significant impact on the quality of the human environment.

10.012 Therefore, I conclude that these activities do not constitute a major Federal action which will significantly affect the quality of the human environment and it is my decision that an environmental impact statement will not be prepared for this activity.

9 January 1975

MAX W. NOAH
Colonel, Corps of Engineers
District Engineer

Technical Appendix

ENVIRONMENTAL ASSESSMENT REPORT

OPERATION AND MAINTENANCE

GRAND MARAIS HARBOR

COOK COUNTY, MINNESOTA

LAKE SUPERIOR

TECHNICAL APPENDIX

TABLE OF CONTENTS

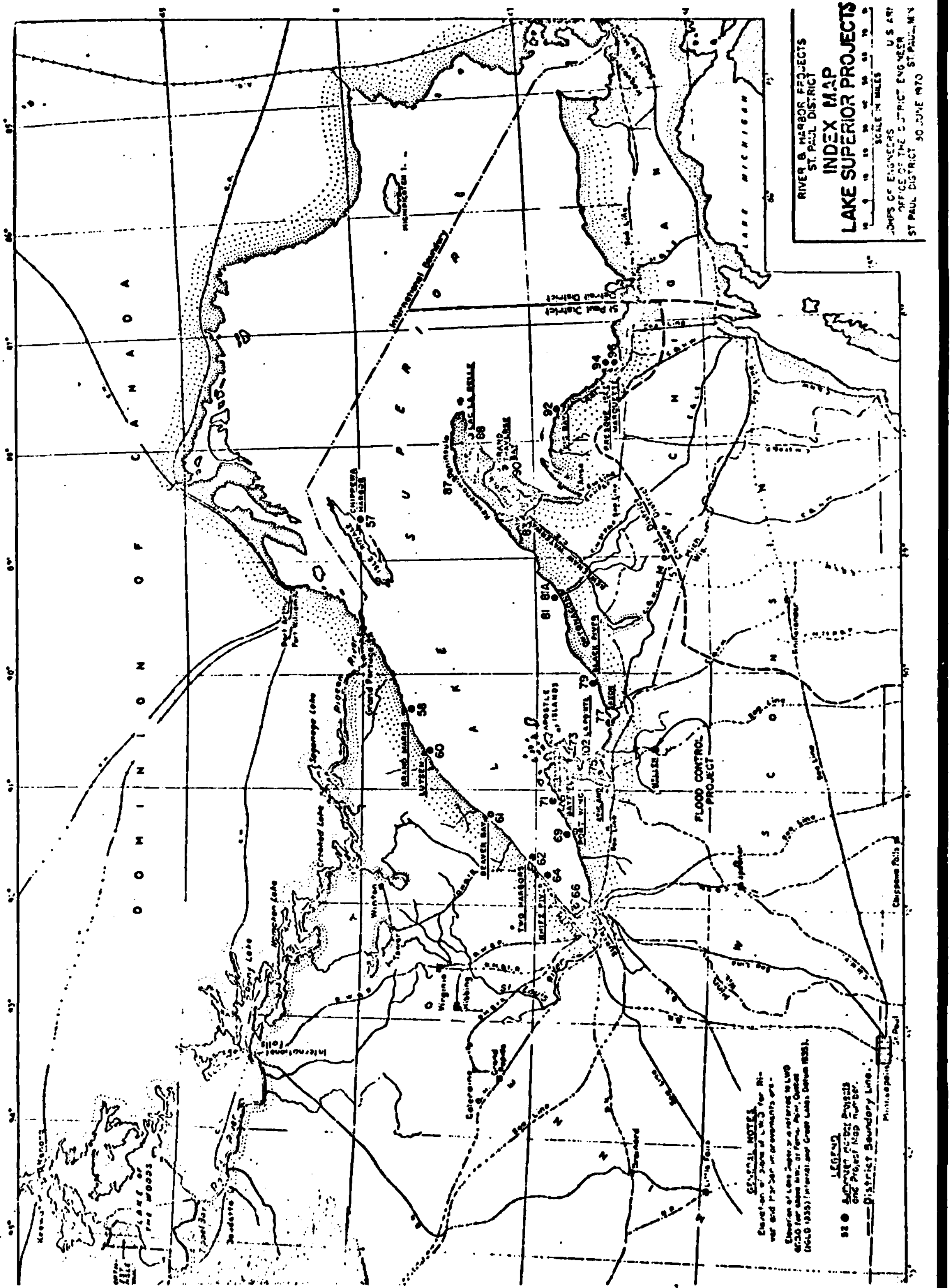
RIVER & HARBOR PROJECTS
ST. PAUL DISTRICT
INDEX MAP
LAKE SUPERIOR PROJECTS
LAKE SUPERIOR
DOMINION OF CANADA
FLOOD CONTROL PROJECT
TWO HARBORS
BEAVER BAY
GRAND MARAIS
CHIPPEWA HARBOR
LEGEND
District Boundary Line
GENERAL NOTES

EXHIBIT 1

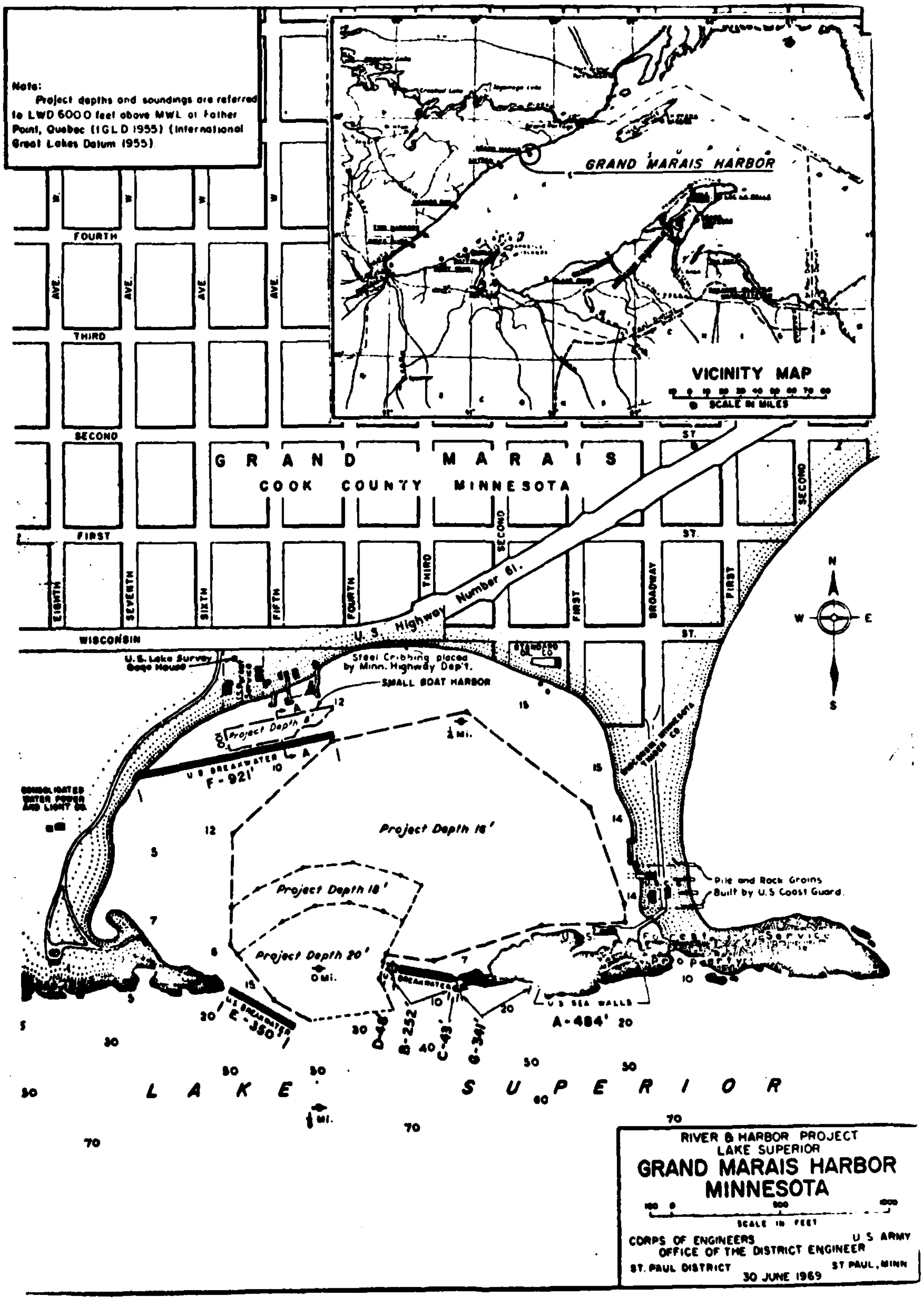
Note:
Project depths and soundings are referred to LWD 600.0 feet above MWL at Father Point, Quebec (IGLD 1955) (International Great Lakes Datum 1955)
GRAND MARAIS HARBOR
VICINITY MAP
SCALE IN MILES
G R A N D M A R A I S
COOK COUNTY MINNESOTA
FOURTH
THIRD
SECOND
FIRST
WISCONSIN
U. S. Highway Number 61
Steel Cribbing placed by Minn. Highway Dep't.
SMALL BOAT HARBOR
U.S. Lake Survey Gage House
Project Depth 8'
U S BREAKWATER
F-921'
Project Depth 16'
Project Depth 18'
Project Depth 20'
Pile and Rock Groins Built by U.S. Coast Guard
U S SEA WALLS
A-484'
E-350'
D-46'
B-252'
C-43'
G-34'
L A K E S U P E R I O R
RIVER & HARBOR PROJECT
LAKE SUPERIOR
GRAND MARAIS HARBOR
MINNESOTA
SCALE IN FEET
CORPS OF ENGINEERS
U S ARMY
OFFICE OF THE DISTRICT ENGINEER
ST. PAUL DISTRICT
ST PAUL, MINN
30 JUNE 1969

EXHIBIT 2

GRAND MARAIS HARBOR, COOK COUNTY, MINNESOTA

EXHIBIT [illegible]

GRAND MARAIS HARBOR OPERATIONAL HISTORY

FY Year	Event Description	Cu. Yds. Removed	Costs $New	Costs $Maint.
1879-1950	New & maint. work	483,146	$209,819	$125,300
1951-54	No work done			
1954-55	Surveys, misc. repairs			1,836
1957	Extend Seawalls			2,135
1958	Extension of seawall, plan small boat harbor		1,506	2,388
1959	Contract for small boat harbor, pier repairs		13,806	20,000
1960	Major project modifications and dredging	1,542	219,751	66,194
1961	Misc. engineering, dredging, condition survey	900	6,090	514
1962	Survey			492
1963-64	Construction & completion of seawall along E. breakwater			31,600
1965	Condition survey			885
1966	Surveys & breakwater repairs			4,155
1967-70	No work			
1972	Dredging and breakwater repairs	3,575		23,000
	Total cubic yards removed through 1972:	487,808		
	Total itemized costs through FY 1972:		450,972	283,168
	Total costs through FY 1972:		$734,100	

* SOURCE: DAILY COMPUTATION SHEETS DREDGING OPERATIONS, USACE to 1950

ANNUAL REPORTS PUBLISHED BY THE USACE SINCE 1950

EXHIBIT 4

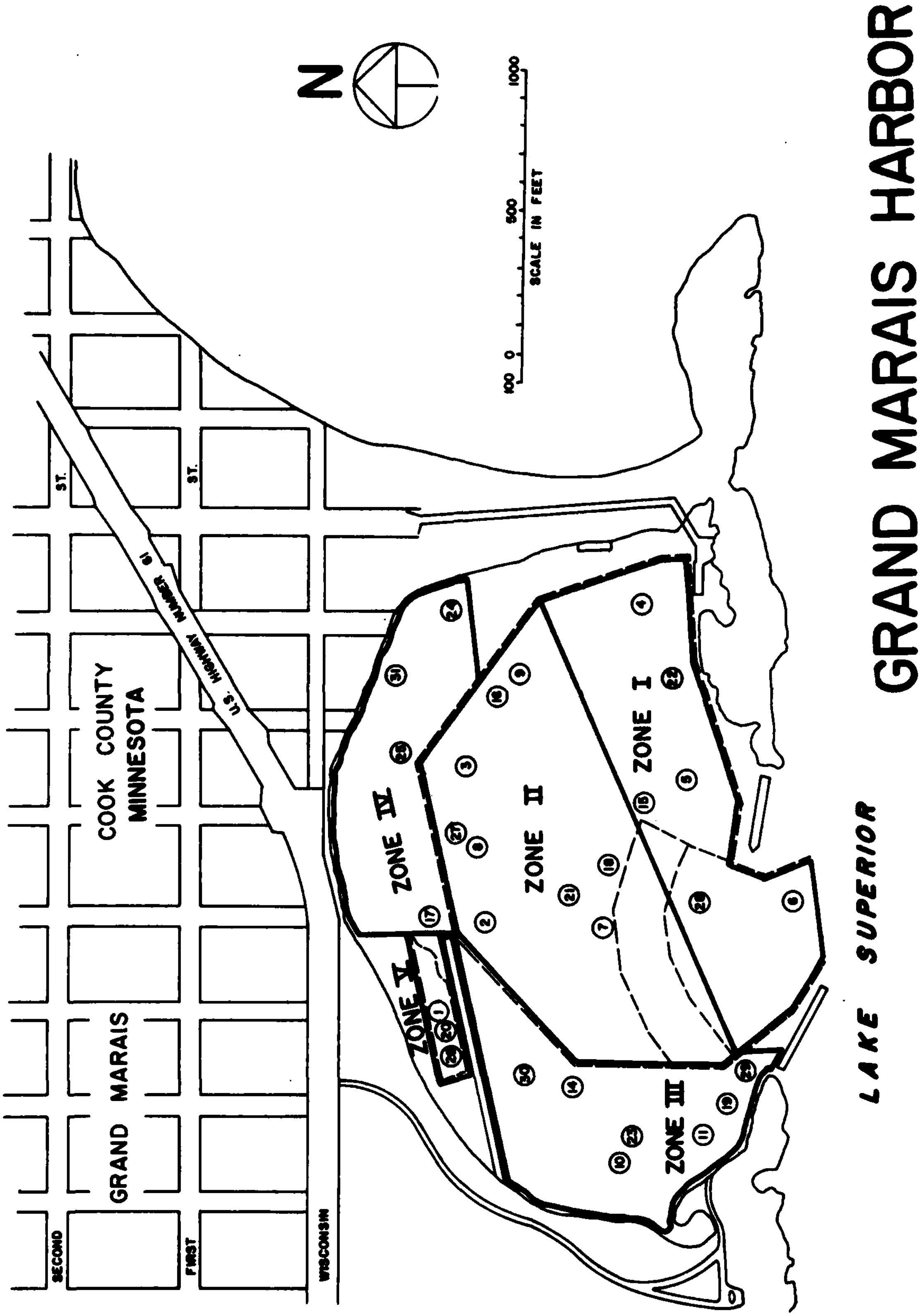
GRAND MARAIS HARBOR
N
0
500
1000
SCALE IN FEET
COOK COUNTY
MINNESOTA
GRAND MARAIS
U.S. HIGHWAY NUMBER 61
SECOND
FIRST
WISCONSIN
ST.
ST.
ZONE I
ZONE II
ZONE III
ZONE IV
ZONE V
LAKE SUPERIOR

EXHIBIT 5

ZONE DESCRIPTION

ZONE	GRAND MARAIS HARBOR
I	The southeast portion of the harbor, extending from the eastern edge to the middle of the entrance to the harbor
II	The center of the outer portion of the harbor
III	The western portion of the harbor between the project area and the western shore
IV	The northeast portion of the harbor between the project area and the northeast shore
V	The inner project area, the small boat harbor located inside of the inner breakwater

EXHIBIT 6

Evaluation Parameters	EPA Guidelines
Volatile Solids	6.0%
C.O.D.	50,000 mg/kg
Total Kjeldahl Nitrogen	1,000 mg/kg
Total Phosphorus	1,000 mg/kg
Oil and Grease	1,500 mg/kg
Mercury	1.0 mg/kg
Lead	50.0 mg/kg
Zinc	50.0 mg/kg

EXHIBIT 7

Summary of the chemical data obtained on bottom sediment samples collected from each zone in Grand Marais Harbor. Samples were collected by EPA, NBI and UMD between 1970 and 1973. As = Arsenic, Cd = Cadmium, Cu = Copper, Pb = Lead, Hg = Mercury, Zn = Zinc.

ZONE		As mg/kg	Cd mg/kg	Cu mg/kg	Pb mg/kg	Hg mg/kg	Zn mg/kg
I	Mean	.48	2.00	23.20	51.20	0.52	182.00
	Std. Dev.	-	-	-	40.70	0.68	167.00
	Range Hi	-	-	-	80.00	1.00	300.00
	Range Lo	-	-	-	22.40	0.04	64.50
	No. of Obs.	1	1	1	2	2	2
II	Mean	-	2.78	14.90	23.70	0.09	44.50
	Std. Dev.	-	1.97	6.07	20.10	0.09	25.80
	Range Hi	-	5.12	21.40	59.20	0.15	70.10
	Range Lo	-	.03	8.00	10.80	0.03	4.88
	No. of Obs.	-	5	5	5	2	5
III	Mean	1.71	1.34	42.30	24.10	0.17	18.90
	Std. Dev.	-	1.85	41.80	16.00	-	19.90
	Range Hi	-	2.64	71.80	35.40	-	33.00
	Range Lo	-	.03	12.70	12.70	-	4.88
	No. of Obs.	1	2	2	2	1	2
IV	Mean	.24	2.97	19.50	30.70	0.62	55.50
	Std. Dev.	-	1.17	6.36	7.90	-	24.20
	Range Hi	-	4.32	24.70	38.80	-	78.80
	Range Lo	-	2.28	12.40	22.90	-	30.50
	No. of Obs.	1	3	3	3	1	3

EXHIBIT 8

SUMMARY OF CHEMICAL DATA (CONTINUED)

ZONE		As mg/kg	Cd mg/kg	Cu mg/kg	Pb mg/kg	Hg mg/kg	Zn mg/kg
V	Mean	-	2.96	39.64	32.60	0.32	95.40
	Std. Dev.	-	-	-	-	-	-
	Range Hi	-	-	-	-	-	-
	Range Lo	-	-	-	-	-	-
	No. of Obs.	-	1	1	1	1	1
TOTAL	Mean	.81	2.54	29.70	30.30	0.33	68.20
	Std. Dev.	.79	1.53	36.80	20.10	0.36	74.64
	Range Hi	1.71	5.12	71.80	80.00	1.00	300.00
	Range Lo	.24	.03	6.07	10.80	0.03	4.88
	No. of Obs.	3	12	17	13	7	13

EXHIBIT 9

Summary of the chemical data obtained on bottom sediment samples collected from each zone in Grand Marais Harbor. Samples were collected by EPA, NBI, and UMD between 1970 and 1973. TVS = Total Volatile Solids, O+G = Oil and Grease, COD = Chemical Oxygen Demand, TKN = Total Kjeldahl Nitrogen, TP = Total Phosphorus.

Zone		TVS %	O+G mg/kg	COD mg/kg	TKN mg/kg	TP mg/kg	pH
I	Mean	34.7	12,900	399,000	9,940	1,810	5.9
	Std. Dev.	27.9	4,710	354,000	15,600	1,830	-
	Range Hi	52.5	16,200	736,000	28,000	3,100	-
	Range Lo	2.6	7,500	30,400	313	519	-
	No. of Obs.	3	3	3	3	2	1
II	Mean	80.1	16,000	729,000	1,900	683	6.6
	Std. Dev.	21.3	13,500	326,000	960	759	-
	Range Hi	94.8	33,200	1,000,000	2,900	1,220	-
	Range Lo	42.8	3,607	345,000	591	146	-
	No. of Obs.	5	4	4	5	2	1
III	Mean	49.6	7,080	360,000	644	864	6.3
	Std. Dev.	47.5	4,440	554,000	742	774	-
	Range Hi	95.8	10,200	1,000,000	1,170	1,410	-
	Range Lo	.9	3,950	22,000	119	316	-
	No. of Obs.	3	2	3	2	2	1
IV	Mean	39.6	13,700	503,000	1,870	59	6.4
	Std. Dev.	44.5	12,100	570,000	2,160	-	-
	Range Hi	79.4	26,000	1,000,000	4,600	-	-
	Range Lo	1.1	740	6,500	100	-	-
	No. of Obs.	4	4	4	4	1	1

EXHIBIT 9

CHEMICAL DATA (CONTINUED)

Zone		TVS %	O+G mg/kg	COD mg/kg	TKN mg/kg	TP mg/kg	pH
V	Mean	13.0	4,150	143,000	2,350	-	-
	Std. Dev.	2.6	778	17,000	1,060	-	-
	Range Hi	-	-	-	-	-	-
	Range Lo	-	-	-	-	-	-
	No. of Obs.	2	2	2	2	-	-
Total	Mean	49.3	12,000	468,000	3,300	967	6.3
	Std. Dev.	37.3	9,630	424,000	6,710	1,080	.3
	Range Hi	95.8	33,200	1,000,000	28,000	3,100	6.6
	Range Lo	.9	740	6,500	100	59	5.9
	No. of Obs.	17	15	16	16	7	4

EXHIBIT 9

SUMMARY OF CHEMICAL DATA

The highest mean value of total volatile solids within a zone was found in Zone 2. The mean value in Zone 2 was 80.1%. All of the zones had mean values which were in excess of the EPA Guideline of 6.0%.

The highest mean values of oil and grease were found in Zone 2. All of the zones had mean values which were in excess of the EPA Guideline of 1,500 mg/kg. Zones 1, 2, and 4 had the highest values of oil and grease. These zones are located along the northeast and southeast shorelines of the harbor. This is the area in which the historic log rafting took place. This activity may have contributed high levels of oil and grease to the water as a result of the materials used.

The highest mean value for chemical oxygen demand was found in Zone 2. All of the zones had mean values which were in excess of the EPA Guideline of 50,000 mg/kg. A number of samples in Zones 2, 3, and 4 had values in excess of 1,000,000 mg/kg. These are the highest values recorded in any of the harbors on western Lake Superior.

The highest mean value for total nitrogen was found in Zone 1. All of the zones except Zone 3, which is located in the western area of the harbor, had values for total nitrogen which were in excess of the EPA Guideline of 1,000 mg/kg.

The highest mean value of total phosphorus was found in Zone 1. This was the only zone in which the mean value was in excess of the EPA Guideline of 1,000 mg/kg.

EXHIBIT 10

SUMMARY OF CHEMICAL DATA (CONTINUED)

The mean pH value of samples obtained by NBI in Grand Marais was 6.3. The total range was between 5.9 and 6.6 units. This range is slightly on the acidic side, the pH of the water which is usually slightly alkaline.

The mean value of arsenic in samples collected from Grand Marais Harbor is 0.81 mg/kg. The overall range was between .24 and 1.71 mg/kg. There are no EPA Guidelines for arsenic in bottom sediments.

The mean values of cadmium were highest in Zones 2, 4, and 5. The association of these zones with the shoreline may be responsible for these values of cadmium. It is known that cadmium is contained in coal and may be contributed indirectly from the burning of coal in homes or businesses.

The highest values for copper were found in Zone 3. This is the east end of the harbor and copper may be contributed by the Consolidated Water, Power and Light Company. Generally the levels of copper in Grand Marais Harbor are low compared to other harbors in western Lake Superior. There are no EPA Guidelines for copper in bottom sediments.

The highest mean value of lead was found in Zone 1. This was the only zone in which the mean value was in excess of the EPA Guideline of 50.0 mg/kg. However, it should be noted that only two samples were taken from this zone. Thirteen samples were analyzed from Grand Marais for lead, and only two were in excess of the EPA Guideline.

The mean value of mercury found in Grand Marais Harbor was .33 mg/ kg. The overall range was from a high of 1.0 mg/kg, the EPA Guideline, to a low of 0.03 mg/kg. These samples collected for mercury were dispersed throughout the zones. However, not many samples were taken from a single zone, and therefore, the characterization of a single zone

SUMMARY OF CHEMICAL DATA (CONTINUED)

cannot be made with great accuracy.

The highest mean value for zinc was found in Zone 1. The mean value in this zone was 182 mg/kg. The overall mean of all samples collected from Grand Marais Harbor was 68.2 mg/kg, which is in excess of the EPA Guideline value of 50.0 mg/kg. The mean values from Zones 1, 4, and 5 were in excess of the EPA Guideline value. However, the number of samples taken from these zones should be taken into consideration in making any judgments regarding disposal of dredge material.

The highest levels of organic parameters were found in Zones 1 and 2. These zones are located on the eastern edge of the harbor and are located in the vicinity of the historic log-rafting activity. As mentioned earlier, samples taken from Grand Marais Harbor were observed to contain wood chips and bark which have remained from the days of log rafting. These materials are no doubt responsible for the high values of organic parameters found in samples taken from these zones.

Generally, the levels of heavy metals in the sediments were low. Zinc was the only metal which exceeded the EPA Guideline values. The overall mean is greatly influenced by one value of 300 mg/kg. It should be noted at this point that while the sediments taken from Grand Marais Harbor have been shown to contain high levels of organic parameters, the sediments collected do not reflect the nature of the harbor bottom in Grand Marais. The experience of sampling from Grand Marais Harbor is that repeated efforts are required to obtain sediments from the relatively small areas of the predominately rock bottom which contain sediment material.

WATER QUALITY DATA

Summary of water quality data obtained on samples collected by NEI and UMD in 1972 and 1973. DO = Dissolved Oxygen, Turb = Turbidity, Cond = Conductivity, Alk = Akalinity, TKN = Total Kjeldahl Nitrogen, TP = Total Phosphorus.

Zone		DO ppm	Temp. °C.	pH	Turb JTU	Cond µ mhos	Alk ppm	TKN ppm	TP ppm
I	Mean	12.6	5.7	7.5	3.8	64	41.0	.353	.004
	Std. Dev.	.1	1.5	.1	-	1.7	2.8	.401	-
	Range Hi	12.7	7.0	7.6	-	65	43.0	.636	-
	Range Lo	12.5	4.0	7.4	-	62	39.0	.069	-
	No. of Obs.	3	3	3	1	3	2	2	1
II	Mean	12.6	4.0	7.5	1.7	66	41.2	.236	.514
	Std. Dev.	.3	2.7	.2	2.5	3.7	1.9	.140	.449
	Range Hi	12.8	7.0	7.6	4.5	70	44.0	.399	.840
	Range Lo	12.2	1.0	7.1	.2	62	39.0	.040	.001
	No. of Obs.	4	6	6	3	6	5	5	3
III	Mean	12.4	4.2	7.5	1.0	66	40.8	.326	1.13
	Std. Dev.	.3	2.6	.2	1.2	3.6	5.0	.310	.970
	Range Hi	12.6	7.0	7.7	2.4	70	49.0	.793	1.760
	Range Lo	11.9	1.0	7.2	.3	61	36.0	.051	.015
	No. of Obs.	5	7	7	3	7	5	5	3
IV	Mean	12.6	6.3	7.5	6.4	67	38.0	.208	.015
	Std. Dev.	.1	1.5	.4	-	3.7	1.7	.290	-
	Range Hi	12.8	7.0	7.9	-	71	39.0	.544	-
	Range Lo	12.5	4.0	7.2	-	62	36.0	.034	-
	No. of Obs.	4	4	4	1	4	3	3	1

EXHIBIT 11

WATER QUALITY DATA (CONTINUED)

Zone		DO ppm	Temp. °C.	pH	Turb JTU	Cond µ mhos	Alk ppm	TKN ppm	TP ppm
	Mean	12.7	7.8	7.3	-	63	39.0	.051	-
	Std. Dev.	.1	.4	.1	-	3.5	-	-	-
V	Range Hi	12.7	8.0	7.3	-	65	-	-	-
	Range Lo	12.6	7.5	7.2	-	60	-	-	-
	No. of Obs.	2	2	2	-	2	1	1	-
	Mean	12.6	5.1	7.5	2.3	66	40.3	.262	.619
	Std. Dev.	.2	2.4	.2	2.4	3.4	3.2	.244	.742
Total	Range Hi	12.8	8.0	7.9	6.4	71	49.0	.793	1.760
	Range Lo	11.9	1.0	7.1	.2	61	36.0	.034	.001
	No. of Obs.	18	22	22	8	22	16	16	8

EXHIBIT 11

Correlation of chemical parameters in samples collected from Grand Marais Harbor. Correlations were calculated on an individual sample basis. Samples were collected by EPA, NBI and UMD from 1970 to 1973.

Correlation	Coefficient	Confidence Level
TVS with COD	0.868	.99
TN with TP	0.879	.99
COD with TP	0.669	.93
COD with TN	0.250	.81
TVS with TP	0.330	.76
TVS with TN	0.117	.67
Pb with Hg	0.944	.99
Zn with Hg	0.874	.99
Pb with Zn	0.838	.99
Cu with Hg	0.415	.79
Cu with Pb	0.223	.76
Cu with Zn	0.192	.72
Fine Particles with TN	.887	.99
Fine Particles with O+G	.417	.92
Fine Particles with COD	.408	.93
Fine Particles with TVS	.263	.83

EXHIBIT 12

Correlation analysis of benthic organism data with organic and metal constituents in sediment samples collected by NBI and UMD from Grand Marais Harbor. The correlations were calculated on an individual sample basis.

Parameters	Coefficient	Confidence Level
Total Organisms with TVS	-.506	.95
Total Organisms with COD	-.244	.78
Total Organisms with TN	.118	.63
Total Organisms with TP	.999	.50
Total Organisms with Pb	-.177	.69
Total Organisms with Hg	-.042	.53
Total Organisms with Cu	.035	.54
Total Organisms with Zn	.288	.79

EXHIBIT 12

CORRELATION ANALYSIS AND SIGNIFICANCE VALUE

A correlation analysis is conducted in order to investigate to what extent certain parameters vary together. That is, do samples which contain high levels of a certain parameter usually contain high (positive correlation) or low (negative correlation) levels of another parameter? The number which describes this correlation is called a correlation coefficient. The correlation coefficient can have values which range from +1.0 to -1.0. Values between 0 and +1.0 indicate a positive correlation; that is, samples with high levels of one parameter tend to have high levels of the other parameter. Values between 0 and -1.0 indicate a negative correlation; that is, samples with high levels of one parameter tend to have low levels of the other parameter. The further the correlation coefficient is from zero (no correlation) the more confidence one has that the correlation is in fact positive or negative. The significance value is a measure of this confidence. Significance values range between 0 and 1.0, and the closer the value gets to 1.0 the more confidence one has in the result. A significance level of 0.95 is considered highly significant, that means that this result (in this case a positive or negative correlation) would be correct 95 percent of the time or that the result would be correct 19 out of 20 times.

EXHIBIT 13

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
1210 U. S. POST OFFICE & CUSTOM HOUSE
ST. PAUL, MINNESOTA 55101

IN REPLY REFER TO
NCSED-ER

31 October 1974

Mr. Roy W. Reaves, III
Denver Service Center
National Park Service
U.S. Department of the Interior
7200 West Alameda
Denver, Colorado 80226

Dear Mr. Reaves:

We are now in the process of preparing a draft Environmental Impact Statement for Operation and Maintenance, Grand Marais Harbor, Cook County, Minnesota, Lake Superior.

In general, the statement will discuss the environmental impacts of Corps of Engineers activities necessary to maintain and operate the harbor. These involve normal breakwater repair and dredging. From 1962 until the present, only minor maintenance, repair and dredging have been performed with 2,575 cubic yards of material removed from the harbor. Though there are no present plans for extensive work in the harbor over the next 10-year period, the Corps estimates that another 3,000 to 4,000 cubic yards will be dredged from the inner harbor during that time. The dredging is necessary because of sediment build-up due to the historic rafting of logs on the east edge of the harbor, recreational boating activity, and wave action of Lake Superior. Without dredging, the inner small-boat basin would soon be rendered useless by the accumulation of sediment material. All dredge material, since 1968, has been disposed of on land. Grand Marais dredge material is presently unclassified by EPA pending reanalysis of harbor bottom material to determine its degree of "pollution." There are, thus, two different alternatives in the proposed dredge disposal program. If the harbor is classified "unpolluted," dredge material will be utilized as beach nourishment outside the harbor north of the Coast Guard station or utilized by area construction companies for public road repair. If the harbor is classified "polluted," dredge material will be utilized

NCSED-ER 31 October 1974
Mr. Roy W. Reaves, III

by area construction companies for public road repair. Two sites have been chosen for temporary (24 hour) stockpiling of the dredged material until it can be hauled away for use. One probable site would be on land at the eastern edge of the harbor about 200 yards north of the U.S. Coast Guard station while the second probable site would be on land north of the western end of the inner breakwater pier on municipal park land.

In compliance with section 106 of the National Historic Preservation Act of 1966 and Executive Order 11593, we are requesting your comments concerning the existence of any historical, archeological and paleontological resources which may exist in the vicinity of Grand Marais, Minnesota, and which may be affected by operation and maintenance activities. Two plates are inclosed indicating the location of Grand Marais and the project dimensions.

The draft Environmental Impact Statement for Grand Marais Harbor is scheduled for completion this fall, 1974, and a copy will be furnished you at that time.

If we can be of any further assistance, please contact us.

Sincerely yours,

NORMAN C. HINTZ
Major, Corps of Engineers
Acting District Engineer

2 Incl
As stated

Identical copies to:

Professor Eldon Johnson
State Archeologist
Department of Anthropology
University of Minnesota
215 Ford Hall
Minneapolis, Minnesota 55455

Mr. Russell W. Fridley, Director
Minnesota Historical Society
Main Historical Building
Cedar Street at Central
St. Paul, Minnesota 55101

EXHIBIT 14

United States Department of the Interior

NATIONAL PARK SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:

Office of Archeology and Historic Preservation
Interagency Services Division
Denver Field Office
P.O Box 25287
Denver, Colorado 80225

H3019-PI

Major Norman C. Hintz
St. Paul District, Corps of Engineers
1210 U.S. Post Office & Custom House
St. Paul, Minnesota 55101

Dear ~~Sir~~:

Thank you for your letter requesting advice regarding operation and maintenance of the harbor at Grand Marais, Minnesota. I have no knowledge of the specific cultural resources in the project area, but I can point out steps you will need to take in preparing your draft environmental impact statement.

The shore of Lake Superior has a high potential for archeological and historical remains. There could be sites, underwater or on-shore, associated with water-related activities. This could include such remains as fishing wiers, fishing and trading camps, and remnants of trails leading away from the lake. The Gunflint Trail near Grand Marais is an example of the latter.

Because your project is concerned with an area that has already been disturbed by construction and dredging activities, it is unlikely that significant remains will be encountered in the operation and maintenance of the harbor itself. However, it is essential that you carefully examine any new areas where you intend to dispose of dredging debris.

In addition, you must consider the long-term indirect effect that operation and maintenance activities might have on cultural resources that are not directly involved in the project. This will necessitate consideration of properties listed on or eligible to be listed on the National Register of Historic Places that are located in the vicinity of the project and its associated activities.

EXHIBIT 14

If I can be of any further assistance, please let me know.

Sincerely yours,

Roy W Reaves, III
Archeologist, Executive
Order Consultant (Denver)

cc: Mr. Russell W. Fridley
Director, Minnesota Historical Society
690 Cedar Street
St. Paul, Minnesota 55101

EXHIBIT 14

..VERSITY OF M...NESOTA
CITIES
Department of Anthropology
215 Ford Hall
Minneapolis, Minnesota 55455

November 18, 1974

Major Norman C. Hintz
Corps of Engineers
St. Paul District
1210 U.S. Post Office
St. Paul, Minnesota 55101

Ref: NCSED-ER

Dear Major Hintz:

In response to your letter of 31 October 1974 requesting comments on proposed operation and maintenance activities at *Grand Marais Harbor*, I can only say that we have no record of any archaeological site in the harbor area. I must qualify this by also saying that the Grand Marais harbor area has never been intensively surveyed for cultural resources, including archaeological sites. An evaluation of the area for purposes of an Environmental Impact Statement is called for.

Sincerely,

Elden Johnson
State Archaeologist

EJ:ml
CC: Alan Woolworth, Minnesota Historical Society

EXHIBIT 14

NCSED-ER

5 December 1974

Professor Elden Johnson
State Archeologist
Department of Anthropology
University of Minnesota
215 Ford Hall
Minneapolis, Minnesota 55455

Dear Professor Johnson:

In your letter of 18 November 1974, commenting on proposed operation and maintenance activities at Grand Marais Harbor, you stated that an evaluation of the area should be made for purposes of an environmental impact statement. In the course of our preparation of the statement we have determined that continuation of operation and maintenance activities in Grand Marais Harbor will not constitute a major Federal action significantly affecting the quality of the human environment. We are therefore preparing a Negative Declaration accompanied by its environmental assessment report. In light of this development we would like to know if you still consider further archeological and historical investigation of the area to be necessary.

In my letter of 31 October 1974, I described our dredging and disposal plans for Grand Marais Harbor. The alternatives described in that letter delineating disposal plans for both polluted and unpolluted sediments are still valid; however, it has become evident that, due to the difficulty in obtaining sediment samples, the Environmental Protection Agency may not classify Grand Marais Harbor for an indefinite period of time. Thus, while the harbor remains unclassified, the Corps will not establish a disposal policy for all Grand Marais Harbor dredging operations. We will, rather, establish a disposal method for each specific operation, which will be subject to the EPA's approval.

EXHIBIT 14

NCSED-ER
Professor Elden Johnson

5 December 1974

Beach nourishment, open lake disposal, and temporary stockpiling until the material can be hauled away for use by area construction companies are all possible disposal methods. Should the harbor be eventually declared nonpolluted, the same three alternatives will remain open to the Corps of Engineers. However, if the harbor is declared polluted, only the temporary stockpiling of the dredge sediment for utilization by area construction companies will be allowed. Construction of a confined disposal site is not an alternative in this case.

The environmental assessment report for Grand Marais Harbor is scheduled for completion in December 1974 and a copy will be furnished you at that time.

If we can be of any further assistance, please contact us.

Sincerely yours,

MAX W. NOAH
Colonel, Corps of Engineers
District Engineer

EXHIBIT 14

UNIVERSITY OF MINNESOTA
TWIN CITIES

Department of Anthropology
215 Ford Hall
Minneapolis, Minnesota 55455

December 10, 1974

Colonel Max W. Noah, District Engineer
Corps of Engineers
St. Paul District
1210 United States Post Office
St. Paul, Minnesota 55101 NCSED-ER

Dear Colonel Noah:

I have your letter of 5 December concerning my earlier comments on archaeological and historical assessments in the Grand Marais harbor area. In view of the added information in your letter, such an archaeological/historical assessment will not be necessary and I concur with preparation of a Negative Declaration.

Sincerely,

Elden Johnson
State Archaeologist

EJ:dl
cc: Alan Woolworth, MHS

EXHIBIT 14