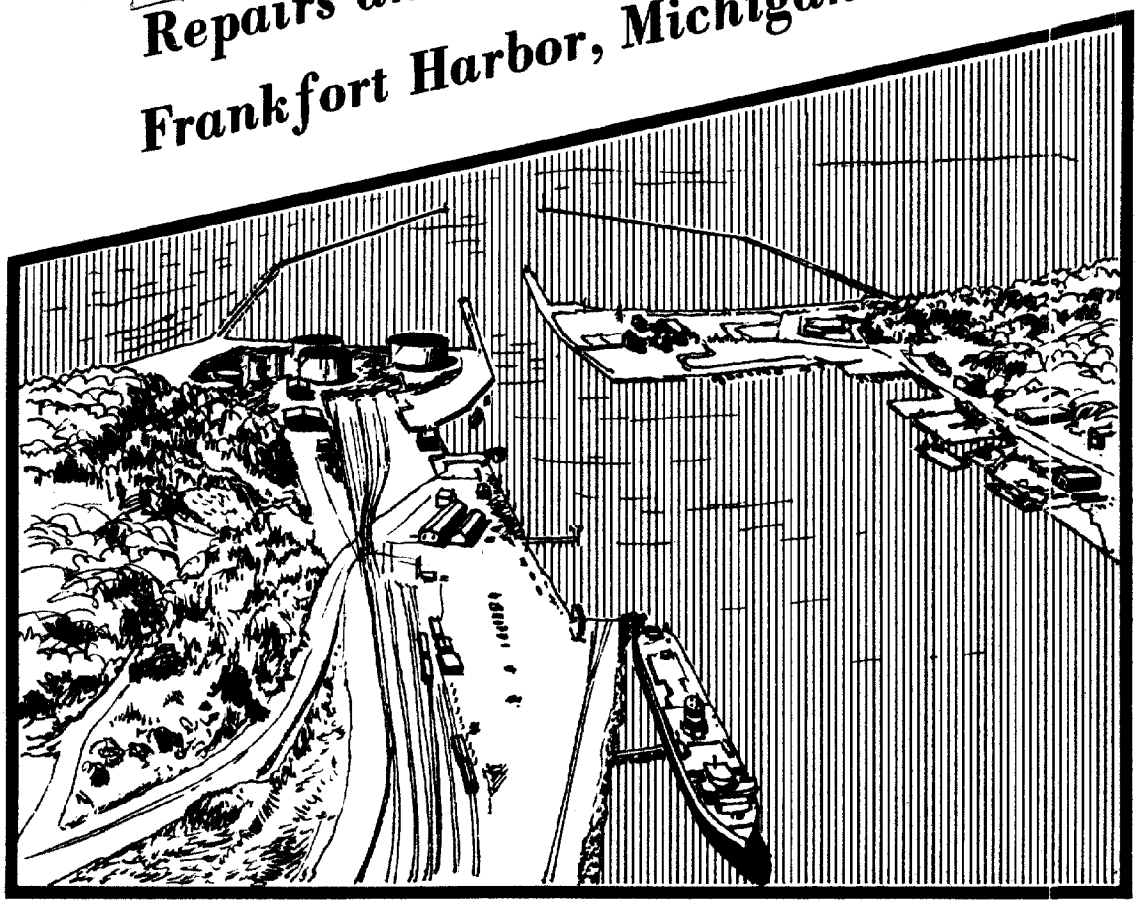
Final Environmental Impact Statement

Dredging, Confined Disposal, Structure Repairs and Operations

Frankfort Harbor, Michigan



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U.S. Army Engineer District,
Detroit, Michigan

FEBRUARY 1980

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
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SUMMARY

CONFINED DISPOSAL FACILITY, DREDGING,
STRUCTURE REPAIRS AND MAINTENANCE OPERATIONS,
FRANKFORT HARBOR, MICHIGAN

( ) DRAFT (X) FINAL ENVIRONMENTAL STATEMENT

RESPONSIBLE OFFICE: U.S. ARMY ENGINEER DISTRICT, DETROIT
Corps of Engineers
P. O. Box 1027
Detroit, Michigan 48231
Telephone (313) 226-6752

1. NAME OF ACTION: (X) ADMINISTRATIVE ( ) LEGISLATIVE

2. DESCRIPTION OF ACTION: This statement addresses the Operation and Maintenance of Frankfort Harbor, Michigan, including dredging, disposal of dredged material and renovation of existing structures. The volume of contaminated material to be dredged totals 114,400 cubic yards and consists of 37,000 cubic yards of backlog dredging, 70,000 cubic yards of maintenance dredging, and 7,400 cubic yards of access dredging. Two sites have been proposed for the disposal of this material, one involves the construction of a confined diked disposal facility on the northern shore of Lake Betsie and the other involves unconfined disposal at an upland site in Fife Lake State Forest, 15 miles southeast of Frankfort. The diked disposal facility would contain approximately 40,000 cubic yards while 74,400 cubic yards of material would be hauled and disposed of at the State Forest site. A mooring area would be constructed at the confined disposal facility and consist of steel sheet piling and pile clusters. Maintenance dredging is necessary to restore the harbor's ability to accommodate commercial and recreational traffic, as is rehabilitation of harbor structures.

3. (A) ENVIRONMENTAL IMPACTS: The project would allow commercial and recreational traffic in the harbor to continue unimpeded. In doing so, it would offer another harbor of refuge. There would be increased employment in the Frankfort area during construction and use of the facility. Upon project completion, the confined disposal facility area would likely be used as a park site in coordination with an adjacent city-owned marina and launching site. Upland containment of the contaminated sediments will preserve the trophic condition of Lake Betsie, the Betsie River and Lake Michigan. Access dredging at the shore disposal site would improve navigation in this area of Lake Betsie. At the upland site, disposal of dredged materials would improve the soil and promote the growth of vegetation. The project would comply with Section 404, Water Quality Act of 1977.

(B) ADVERSE ENVIRONMENTAL EFFECTS: Dredging of an access channel

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to the disposal facility would destroy small areas of littoral zone habitat in Lake Betsie. Construction of the diked facility would result in removal of weedy communities and willow thickets. Noise due to construction traffic and placement of pile clusters and steel sheet piling would affect users of the existing recreational areas, businesses and nearby residents. Increases in traffic, dust and noise would accompany the trucking of dredged materials to the upland disposal site. Maintenance dredging would destroy or disturb benthic communities in the channels and temporarily reduce water quality in the harbor through suspension of materials. Rehabilitation of the structure would result in temporarily increased traffic and possible disturbance of benthos and fish communities, through minor temporary effects upon water quality.

4. ALTERNATIVES: The following alternatives were studied:

a. No action.
b. Disposal of all sediments in open water.
c. Pretreatment of materials.
d. Use of other disposal sites.
e. Maintenance dredging to different depths.

5. COMMENTS REQUESTED:

Federal Agencies

Advisory Council on Historic Preservation
U. S. Department of the Interior
U. S. Environmental Protection Agency
U. S. Department of Commerce
U. S. Department of Agriculture
U. S. Department of Transportation
U. S. Department of Health, Education, and Welfare
Federal Power Commission

State Agencies

Michigan Department of Natural Resources
Michigan Department of State Highways and Transportation
Michigan Department of State - Michigan History Division
Michigan Department of Agriculture
Michigan State University - Conference of Michigan Archeology
Michigan Department of Commerce

Local Agencies

City of Frankfort
Village of Elberta
Benzie County
Benzie County Planning Commission

Environmental - Civic Groups

Great Lakes Commission
Great Lakes Basin Commission
Lake Carriers Association
Michigan United Conservation Clubs
Lake Michigan Federation
Historical Society of Michigan
National Audubon Society
Izaak Walton League
Sierra Club
Michigan Student Environmental Conference
Michigan Audubon Society
Michigan Natural Areas Council
National Wildlife Federation
Ducks Unlimited
Michigan Duck Hunter Association

6. COMMENTS RECEIVED:

Federal Agencies

U. S. Department of Agriculture

Soil Conservation Service
Forest Service

U. S. Department of Transportation

Region 5 Federal Highway Administration
St. Lawrence Seaway Development Corporation

Federal Energy Regulatory Commission

U. S. Department of Commerce

Assistant Secretary for Science and Technology
National Oceanic and Atmospheric Administration

U. S. Environmental Protection Agency

U. S. Department of the Interior

Secretary, North Central Region

State Agencies

State of Michigan
Department of Natural Resources
State Historic Preservation Officer

7. DRAFT STATEMENT TO COUNCIL ON ENVIRONMENTAL QUALITY ON 30 Sept. 1977.
FINAL STATEMENT TO ENVIRONMENTAL PROTECTION AGENCY ON _____.

Table of Contents

Section	Title	Page
	SUMMARY	i
1.	PROJECT DESCRIPTION	1
	A. General	1
	B. Purpose	2
	C. Authorization	2
	D. Materials to be Dredged	2
	E. Dredging Operations	3
	F. Disposal Facilities	3
	G. Renovation of Harbor Structures	6
	H. Economics	7
2.	ENVIRONMENTAL SETTING OF THE PROJECT AREA	7
	A. General Introduction	7
	B. Geology	8
	C. Hydrology	9
	D. Potable Water Supply	11
	E. Wastewater	11
	F. Harbor Sediment Quality	12
	G. Flood Hazard Area	13
	H. Currents	13
	I. Climate	13
	J. Vegetation	14
	K. Fauna	15
	L. Cultural Elements, Aesthetics	16
3.	RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS	21
4.	PROBABLE IMPACT OF THE PROPOSED PROJECT ON THE ENVIRONMENT	21
	A. General	21
	B. Wetlands	22
	C. Vegetation	22
	D. Water Quality	23

Table of Contents (Continued)

Section	Title	Page
	E. Vectors	24
	F. Air Quality	24
	G. Benthos, Including Shellfish	24
	H. Fishery Resources	25
	I. Wildlife	25
	J. Recreation	25
	K. Socioeconomic Effects	26
	L. Flooding	27
	M. Commercial Fishing	27
	N. Threatened and Endangered Species	27
	O. Municipal Water Supplies	28
	P. Summary of Beneficial and Adverse Effects and Mitigating Measures	28
	Q. Conformance to Regulations Concerning Confined Disposal Facilities	28
	R. Conclusions	30
		31
5.	UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS.....	31
6.	ALTERNATIVES TO THE PROPOSED ACTION.....	31a
	A. Open Water Disposal	31a
	B. Alternative Diked Disposal Sites	31a
	C. Pretreatment	32
	D. No Action Alternative	32
	E. Dredging Methods, Project Area & Dredging Depths	33
7.	RELATIONSHIP BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY.....	33
8.	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES WHICH WOULD BE INVOLVED SHOULD THE PROPOSED ACTION BE IMPLEMENTED.....	34
9.	COORDINATION.....	34
	A. Public Participation	34
	B. Government Agencies	34
	C. Citizen Groups	34
	D. Comments Received and Responses to them	35
REFERENCES CITED.....		48
GLOSSARY.....		51

CONFINED DISPOSAL FACILITIES, STRUCTURE REPAIRS AND MAINTENANCE DREDGING FOR FRANKFORT HARBOR, MICHIGAN

1. PROJECT DESCRIPTION

A. General

1.01 Maintenance dredging of the navigable waterways in the Great Lakes is performed by the U. S. Army Corps of Engineers as authorized by Congress. An average of approximately 12,000,000 cubic yards of sediments must be removed per year from 64 Great Lakes harbors and 157 miles of improved channels. The purpose of the maintenance dredging is the restoration of authorized depths in the established projects. These waterways provide vital transportation routes for bulk materials, economic stimulus, and increased opportunities for recreational utilization of water resources.

1.02 Frankfort Harbor, in the City of Frankfort, is located on the east shore of Lake Michigan, 204 miles northeast of Chicago, Illinois and 28 miles north of Manistee, Michigan. The harbor is formed by the western end of Lake Betsie, a connecting channel to Lake Michigan, and a sheltered area in Lake Michigan which is formed by two arrowhead breakwaters. The Betsie River is about 33 miles long and flows northwest into Lake Betsie. Frankfort is located on the northern shore of Lake Betsie and the Village of Elberta is on the southwestern shore

1.03 The project encompasses:

1. The maintenance dredging of sediments unsuitable for open lake disposal in the commercial turning basin and the recreational anchorage area, Frankfort Harbor, Michigan.

2. Maintenance dredging and open lake disposal of sediments in the other Frankfort Harbor project areas.

3. The construction of a diked disposal facility for containing or storing a portion of the sediments.

4. Transportation of the remainder of the sediments which are unsuitable for open-water disposal to an upland disposal site in Fife Lake State Forest.

5. Repair of harbor structures (Maintenance of harbor structures was also addressed in an environmental assessment and negative declaration dated 5 April, 1979 "Structure Repair at Frankfort Harbor, Michigan.)

B. Purpose

1.04 Heavy shoaling has occurred in the northwest and northeast corners of the commercial turning basin and in the northwest portions of the recreational anchorage area in Frankfort Harbor. According to the Environmental Protection Agency, these sediments are not suitable for open lake disposal. The construction of the proposed diked disposal facility, coupled with unconfined disposal at the State Forest site, would solve the disposal problem for materials dredged from the areas in which shoaling has occurred. This, along with maintenance dredging of the other project areas, and renovation of harbor structures, would allow for restoration of the harbor's ability to safely accommodate commercial and recreational traffic, and provide shelter during unfavorable weather conditions.

C. Authorization and Dimensions of Dredging

1.05 The existing Federal Navigation Project, known as the Frankfort Harbor, was authorized by the River and Harbor Act of 1886 and modified under the provisions of Section 107 of the River and Harbor Act of 1960. The outer harbor was last dredged in 1977. Maintenance in this project area includes dredging the basin 20' deep and 800' wide at the entrance, decreasing toward the new pier heads to 600' wide, dredging the approach and entrance channel through the outer basin to a depth of 24' from deep water in Lake Michigan to a point 500' landward of the opening between the breakwaters over the entire width outside the breakwaters, and to a maximum width of 500' inside the breakwaters, thence to a depth of 23' through the inner portion of the outer basin to the outer end of the north pier over widths decreasing from 500' to 160', thence to a depth of 22' between the piers to the inner basin in Lake Betsie.

1.06 Maintenance dredging of the manuevering basin includes removing materials from an 18' deep interior basin in Lake Betsie from within 50' of existing structures on the west and extending eastward approximately 1,550' to the eastern boundary and from within 50' of existing structures on the north and extending southward 800' to the south boundary. Maintenance of the recreational craft anchorage area consists of removal of materials from an area 10' deep and 300' wide extending 600' eastward of the east limit of the interior basin, with its north side in line with the north limit of the basin. (See map, Page A-18.)

1.07 Based on annual shoaling rate of 4,000 cubic yards in the turning basin and 3,000 cubic yards in the anchorage area, it is estimated that there is 37,000 cubic yards of estimated backlog plus 70,000 dubic yards of ten-year maintenance dredging.

D. Materials to be Dredged

1.08 Bottom sediments in certain portions of Frankfort Harbor

Navigational Project have been classified as unsuitable for open water disposal by the Environmental Protection Agency. A location map and an evaluation of the sediment samples are included in Appendix A.

1.09 The bottom material to be removed is expected to be similar to that removed by previous dredging operations. Bottom deposits can be described as organic silts, sandy clay, and silty sand. These deposits contain some organic material which will exert an oxygen demand. The shoals are believed to have originated from the shallower natural lake bottom on the sides of the commercial basin. In addition, sediments are carried into the lake via the Betsie River and other tributaries. Movement of the material is caused by wave action, propeller wash and, to some degree, by ice action.

E. Dredging Operations

1.10 Bottom sediments in the Frankfort Harbor project classified as suitable for open lake disposal are normally dredged annually by hopper dredge. The material is disposed of in approved disposal sites located in Lake Michigan. The bottom sediments in the commercial turning basin and recreational anchorage area have not been dredged since these areas of the project were constructed in 1969. Maintenance dredging was suspended in these areas in 1970, when the Governor of the State of Michigan requested that open water disposal of contaminated sediments be discontinued. The outer harbor was last dredged in 1977.

1.11 Dredging in the navigation project would be done by contractor. The polluted portion of the bottom material would be transferred to one of the two disposal sites. Scows filled by the dredge would be moved by workboat to the mooring facility. The maximum draft of the scow and workboat would be seven feet. A maneuvering area 250' long x 200' wide would be dredged to this depth at the diked disposal site (See Figure 2). Access to the area would be from the existing anchorage area, which is dredged to a depth of ten feet. A crane with clam-shell would place the material into the diked disposal area from the scow. The dredged material would be spread by bulldozers within the disposal area. Excess material would be placed in trucks for transport to the state forest site (See Figure 8). Suitable materials would be deposited in a State approved open water site in Lake Michigan (See Public Notice, Appendix C).

F. Disposal Facilities

1.12 The authority for the construction of a contained disposal facility is Section 123 of the River and Harbor Act of 1970 (Public Law 91-611). Subject to the provisions stated below, this authorizes the Secretary of the Army, acting through the Chief of Engineers, to

construct, operate, and maintain diked disposal facilities with the concurrence of appropriate local governments.

1.13 Public Law 91-611 states that prior to construction of any such facility, the appropriate State or States, interstate agency, municipality, or other appropriate political subdivision of the State, shall agree in writing to: (1) furnish all lands, easements, and rights-of-way necessary for the construction, operation, and maintenance of the facility; (2) hold and save the United States free from damages due to construction, operation, and maintenance of the facility except for negligence; and (3) maintain the facility after completion of its use for disposal purposes in a manner satisfactory to the Secretary of the Army.

1.14 The appropriate non-Federal interest or interests agree to contribute 25 percent of the construction costs unless it is waived by the Secretary of the Army upon a finding by the Administrator of the Environmental Protection Agency that the area to which such contribution applies is meeting applicable water quality requirements and standards. The local costs of the construction were waived by the District Engineer, Detroit District Corps of Engineers, by letter dated 27 December 1976. Project costs related to the non-contained disposal of dredged material at Fife Lake State Forest will be funded using regular operation and maintenance, general funds. Therefore, all construction costs of the project would be assumed by the Federal Government.

1.15 The two sites selected for containing the materials were designated as Site 4 and Site 9. Site 4 is on the north shore of Lake Betsie and Site 9 in the Fife Lake State Forest. Site 4 would be used in conjunction with the Fife Lake State Forest site. Site 4 is a permanent site with a storage capacity of approximately 40,000 cubic yards. Excess material from this site would be taken to the State Forest site for ultimate disposition.

1.16 Site 4 was recently acquired by the local sponsor, the City of Frankfort.

1.17 Site 4 is located on the north shore of Lake Betsie in the City of Frankfort. The site is immediately south of Main Street between Seventh and Ninth Street. It is proposed to construct a confinement facility, approximately 4 acres in area, which would provide disposal volume for approximately 40,000 cubic yards. This site, plus the state forest site, would provide a combined capacity of 114,400 cubic yards. This represents the anticipated ten-year dredging volume plus the backlog dredging, plus the access dredging.

1.18 The proposed disposal facility at Site 4 would require earthen dikes on the east and west side, 260 and 140 feet in length respectively, constructed at the site perimeter. The south side of the

site, adjacent to the lake, would be enclosed with approximately 800 linear feet of earthen dike, protected on the lake side by stone. The stone would be graded in various sizes, ranging from small mattress stone to armor stone, and placed on plastic filter cloth. The dike core would be constructed of a graded, granular fill. The dike crest would be 10 feet above Low Water Datum (approximately 7 feet above the shoreline in July 1977), 10 feet wide at the top and have side slopes of 2 horizontal to 1 vertical. The remaining 100 feet of shoreline would consist of an earthen dike with sheet piling protection on the outer face. The bulkhead would not extend more than 10 feet lakeward of the existing shoreline. The side dikes would have 2 to 1 slopes. These would have an effective height of 10 feet above Low Water Datum, tapering to meet the existing grade south of Main Street. The west dike would have a top width of 15 feet to provide access for the crane to the mooring area. The east dike would have a top width of 10 feet for vehicular access only. (See Figure 6)

1.19 The containment facility would be provided with a mooring facility of steel sheet piling along the Lake Betsie shoreline. Two pile clusters, spaced 80 feet apart, would be placed in the mooring area adjacent to the sheet piling and work area where the scows would be unloaded. The sheet piling would allow a land based crane to unload the moored scow within a relatively short working radius. The top of the dike adjacent to the mooring area would be 24 feet wide to provide an adequate working area. The internal side slope would be 2 horizontal to 1 vertical.

1.20 A two foot thick layer of clay would be used to seal the walls of the dikes while the floor of the facility would be sealed with a plastic liner or bentonite sealer in order to prevent seepage of potentially contaminated material into the surface or ground waters. The exterior side slopes and tops of the side dikes would be seeded with grass. A chain link fence would be constructed around the dike perimeter for security of the area during the period of dredging operations. The existing brush growth along Main Street and within the fill area would be removed, as would some buildings and foundations which presently exist there. Drainage adjacent to the disposal area would be re-routed from the disposal area to assure that offsite stormwater runoff would not be carried into the stored sediment. The effluent from the diked disposal area would be released into Lake Betsie through an oil skimmer and weir system. The discharge from the skimmer would outlet to the lake near the southeast corner of the site.

1.21 Initial work at this site would be clearing and grubbing. This would include removal of existing buildings and rubble; i.e.piles of broken concrete, steel, earth, etc. This would be followed by construction of any needed truck access routes, access channel dredging, and construction of the mooring facility, earthen dikes, and outlet weir.

1.22 Site 9 is located approximately 15 miles southeast of Frankfort in the Fife Lake State Forest (See Figure 9). It consists of 3 upland areas which are identifed on Figure 8 as Areas A, B and C. It is proposed to spread the dredged material 6 inches deep upon the parcels, mix it with the existing soil by discing, and seed the resulting surface with natural grasses.

1.23 Parcel A contains approximately 20 acres. The soil is sandy and is covered with low weeds, moss, and a few trees. For adequate truck access, an existing small road would be improved from Highway M-115 to the area. Parcel B is approximately 60 acres in size and is similar to A.

1.24 Parcel C is an old apple orchard approximately 90 acres in size. Over half of the apple trees have died and fallen. This gives sufficient room between the trees to spread the dredged material.

1.25 Approximately 80 acres of state forest property would be utilized. The material would be distributed first at Area A, then at Area B and finally at Area C. The materials would be trucked from the disposal site in Frankfort at 9th Street along Main Street and M-22 to Highway M-115. This route does not pass through the business district. Rather, it passes by the wastewater treatment plant and a frozen foods plant. Dust, noise, and dirt would be kept to a minimum and roads would be maintained at least in the state of repair in which they existed before construction.

G. Renovation of Harbor Structures

1.26 The following structures would be repaired or renovated, as necessary. The outer harbor structures consist of two breakwaters, 450 feet apart at the outer ends, diverging at an angle of 90°, the main arm and shore connection on the north breakwater being 972' and 1000' in length, respectively, and the main arm and shore connection of the south breakwater being 1,188' and 1,400' in length, respectively. The breakwaters are built of concrete caissons and their shore connectors are concrete capped timber pile structures. The north pier and revetment are stone filled timber crib and piling structures, capped with concrete. The outer 815' of the north pier and revetment has been encased with steel sheet piling and concrete capped. The south pier and revetment are stone filled crib and piling structures. The outer 36' of the south pier is encased with steel sheet piling with grouted stone capping and the inner 476' of the south revetment is a steel sheet piling wall with sand fill. Fence barricades, with gates, are installed on the north breakwater. These barricades are removed during winter months. Structure repairs were previously addressed in a negative declaration and environmental assessment dated 5 April 1979, entitled "Structure Repair at Frankfort Harbor, Michigan".

H. Economics

1.27 The District Engineer is directed to provide maintenance of established navigation projects. As the maintenance operations for these existing projects are contained in their original authorization, no benefit/cost data are required for evaluation of the work.

1.28 It is also the responsibility of the District Engineer to be aware of utilization at each project and to furnish justification for continued maintenance with his request for funds.

1.29 The construction of diked disposal facilities is an aspect of continued maintenance of this project. Strict regard for benefit/cost ratios is not required for their construction since Congress has directed the Secretary of the Army, under authority of the River and Harbor Act of 1970, P.L. 91-611, Section 123, to contain dredged material in confined disposal sites. The containment of polluted material is considered a temporary measure to relieve unacceptable stress upon the water bodies subject to open lake disposal, rather than a permanent solution to the disposal problem. However, economic considerations are an important consideration in site selection.

1.30 Proposed Schedule:

Final Environmental Impact Statement	February 1980
Advertise Contract	May 1980
Commence Construction	June 1980
Complete Construction	July 1981
Begin Disposal in Diked Area	Spring 1982

2. ENVIRONMENTAL SETTING OF THE PROJECT AREA

A. General Introduction

2.01 Frankfort Harbor is situated on the eastern shore of Lake Michigan, in Benzie County, approximately 204 miles northeast of Chicago, Illinois, 100 miles north of Muskegon, and 30 miles southwest of Traverse City (Figure 1). The harbor protects the channel connecting Lake Michigan and Betsie Lake and consists of an outer basin inclosed by two shore-connected converging breakwaters, piers, a revetted channel to Lake Betsie, an entrance channel, an interior basin 18 feet deep in Lake Betsie (inner harbor), and a 10-foot anchorage area.

2.02 The River and Harbor Act of 26 August 1937 authorizes dredging of Lake Betsie; and the River and Harbor Act of 27 October 1965 authorizes channel deepening, extension of the inner basin and dredging of the recreational anchorage area. Over the past ten years,

the Corps has removed approximately 389,000 cubic yards of shoaled sediments, using a hopper dredge. Disposal of these sediments was at the 18-foot contour in the open waters of Lake Michigan within a mile south of the harbor.

2.03 Surveys performed by the Environmental Protection Agency reveal that the sediments of the interior harbor are unsuitable for open lake disposal. It is not in accordance with present practices of the District to continue open water disposal of sediments from the interior harbor which contain adverse materials. This would also conflict with the express wishes of the Governor of the State of Michigan and the Environmental Protection Agency. Moreover, authorization to confine such sediments is contained in the River and Harbor Act of 1970. A diked facility with a capacity of 40,000 cubic yards would be constructed to contain a portion of the 10 year annual shoaling (7,000 cubic yards per year), or approximately 70,000 cubic yards of contaminated sediments, the current backlog of 37,000 cubic yards and 7,400 cubic yards of access dredging (Figures 2-6).

B. Geology

2.04 The western part of Benzie County is marked by high and rugged sandy moraine uplands, interspersed with lakes which range in size from several hundred acres Lake Betsie to several square miles (Crystal and Platte Lakes). Most of the lakes occupy depressions or relic embayments of Lake Michigan which were impounded on the west by dunes and beach-bar complexes in post-glacial times (1, 2, 3).

2.05 Platte Lake and Lake Betsie are fed by rivers of the same names which arise in the extensive high glacial outwash tracts of eastern Benzie County and western Grand Traverse County, 20 to 25 miles inland from Lake Michigan. The Betsie River is impounded by the Homestead Dam approximately ten miles upstream from Lake Betsie, and close to the inland limit of an ancient embayment. Below the Dam, the river follows a meandering course on a broad outwash valley floor to Lake Betsie on a gradient of 2-1/2 to 3 feet per mile. A prominent feature of the Betsie River watershed is Crystal Lake, whose only outlet is a short tributary which joins the Betsie River six miles upstream from Lake Betsie (2). Deer Creek, which passes about one-half mile from the Fife Lake State Forest disposal site, enters the Betsie River about 3-1/2 miles above Homestead Dam.

2.06 Lake Betsie and Lake Michigan occupy the lowest elevation in the region which varies from 576 to 580 feet according to existing lake levels. Within two miles of Lake Betsie to the northwest, a moraine rises to an elevation of 970 feet, providing local relief of approximately 400 feet. The low marginal terraces of Lake Betsie,

rising about 30 feet above its shores, are occupied by the communities of Frankfort and Elberta (2).

2.07 In the Frankfort Harbor area, immediately south of Betsie Lake and west of Elberta, high sand dunes rise 310 feet above the Lake Michigan shores. High dunes also line the Lake Michigan shore between one and two miles north of Frankfort (1-4). The dunes are susceptible to erosion by wind and water in some areas which are unprotected by vegetation.

2.08 The shallow bedrock of the region consists of shales of the Ellsworth and Antrim formations. The bedrock here is remote from the land surface, lying 450 to 440 feet deep in Benzie County (5, 6).

2.09 Agricultural soils in Benzie County north and east of Lake Betsie include well-drained loams and sandy loams of the Nester-Iosco-Emmet Association, which occupy the Betsie River embayment below the Homestead Dam. Deeply drained sands of the Wexford-Emmet-Kalkaska-Rubicon Association mantle the moraine uplands around and between Betsie and Crystal Lakes, and the high outwash terrain at the Betsie River valley east of the dam (7, 8).

2.10 Erosion by surface runoff in the Frankfort Harbor area is strongly related to steep slopes (greater than 12%), and the erosion by wind is related to the clean sand texture and sloping faces of the dunes. Steep slopes mark the sand dune uplands which rise within a few hundred feet of the Lake Betsie south shore and the moraine uplands between Lake Betsie and Crystal Lake to the north. The north shore of Lake Betsie abuts gently sloping land which includes Frankfort Village; but the Betsie River valley floor is bounded by steep slopes along much of its length from the lake to the Homestead Dam (2, 8). Nearly all sediments eroded in the basin above the Homestead Dam are trapped behind it.

2.11 Erosion from these hills in post-glacial times has led to sedimentation in the Betsie River Channel and Lake Betsie. Nearly all natural sediment in Lake Betsie has been transported there by the River.

C. Hydrology

2.12 Lake Michigan - Lake Michigan is the dominant surface water body in the region. Lake Michigan elevations are referred to the mean water level at Father Point Quebec (International Great Lakes Datum, 1955). Low water datum for Lakes Michigan and Huron lies at 576.8 feet.

2.13 Over the 117 year history of lake level observations, the range of Lake Michigan has been 6.6 feet. The greatest variation

within a calendar year, based on the highest and lowest monthly means, was 2.21 feet in 1943, and the smallest annual fluctuation was 0.36 feet in 1941. Normal seasonal fluctuations in water level are approximately one foot, with the highest levels occurring in July and the lowest levels in February. The highest lake level recorded in recent times was 4.2 feet above low water datum or 581.04 feet in July 1974. Mean lake levels have declined since 1974 with the most pronounced change occurring in mid-1974 (May) when the lake elevation fell 1.8 feet. Lake levels fell below average levels (1900-1976) in June 1977 - an event which had not occurred in the previous five years. The levels of lakes and embayments which are connected to Lake Michigan, such as Lake Betsie, are largely controlled by Lake Michigan levels. Significant differences in elevation between Lake Betsie and Lake Michigan occur only for a period of hours during storms and seiches, when lake levels can change by one or two feet over a day's time (12, 13).

2.14 Betsie River Watershed and Water Quality - Lake Betsie is approximately 1-1/2 miles long with a width between 1,000 and 2,000 feet, and an area of 250 acres. It has a maximum depth of 22 feet and an approximate volume of 120 million cubic feet. The average outflow of 350 cubic feet per second produces an average hydraulic retention time of four days. Lake Betsie drains a land area of 245 square miles. There is greater flow in the Lake Betsie outlet through Frankfort Harbor than in any other outlet to Lake Michigan in Benzie County. Most of this water is derived from the portion of the Betsie River drainage basin exclusive of Crystal Lake. The total drainage area of the Betsie River is approximately 245 square miles, while that of Crystal Lake is between 30 and 40 square miles. The total flow contribution to the Betsie River from Crystal Lake is only 15 cubic feet per second, or less than 5 percent of the total (10, 13). The Betsie River is a designated trout stream throughout its length. Water quality information upon Betsie River/Lake Betsie is available from July 1968 through December 1976. The 1968 river data indicated fairly high water quality, although there is heavy plant growth in locations along most of the length of the river (17 and Appendix A). Data from 1976 indicate excessive total and fecal coliform bacteria during the summer at the Lewis Bridge, three miles upstream from the lake. Data from 1972 indicate that Lake Betsie is eutrophic and that productivity is phosphorus-limited (18). Frankfort and Elberta were estimated to contribute 48 percent of the total phosphorus load delivered to the lake via their municipal wastewater treatment plant effluents. Non-point sources from the Betsie River contribute approximately 52 percent of the input. The present use of the lake water at the mouth is limited to industrial water supply.

2.15 Groundwater - Groundwater in the region is abundant and is

sensitively connected to the land surface and surface water. The lakes are excellent surface expressions of the groundwater table and they also receive groundwater discharged from the surrounding highlands. An extensive water table aquifer underlies the entire area. Private wells for domestic water supply are easily developed and the water quality is generally excellent, as indicated in Table 1, which lists quality parameters for a number of municipal wells in the region (7). Wells constructed in the western third of Benzie County yield between 100 and 500 gallons per minute (8, 14).

2.16 In low areas, especially adjacent lakes and the lower reaches of streams, flowing artesian wells are common (8). Locations very near to the shores of the lakes are likely to lie over natural groundwater discharge zones. Such zones offer groundwater protection by resisting the penetration of the water table by downward percolating water.

D. Potable Water Supply

2.17 The Frankfort city wells are located one quarter to one half mile north of the proposed confined disposal facility site on the north shore of Lake Betsie. The three wells are screened in granular materials at depths below 140 feet, above which lie approximately 80 feet of protective clay. There are no potable surface water intake points in Lake Betsie. Municipal well water quality for Frankfort and Elberta are summarized in Table 1. East of Frankfort, in the uplands within one quarter to three quarters of a mile from the proposed sites, the residences are served by private wells. These wells are "upstream" from the site in the pattern of groundwater movement (15). Therefore, groundwater would flow from the wells toward Lake Betsie rather than in the reverse direction.

E. Wastewater

2.18 Treated municipal sewage wastewaters are discharged into Lake Betsie. The City of Frankfort has a primary treatment plant serving more than 95 percent of the population. It discharges into the lake near Ninth Street close to the east boundary of the proposed permanent disposal site (Site 4). The combined storm/sewage collection system bypasses the treatment plant to discharge directly into Lake Betsie when wet weather flow exceeds the raw sewage pump capacities. The approximate average flow to the treatment plant is 270,000 gallons per day (7). The City of Elberta has a primary treatment plant that discharges into the east end of Lake Betsie near the intersection of Frankfort Avenue and Highway M-22. Storm and sewage collection systems are separate, but infiltration into the system is high during wet weather. There is no indication of need to bypass a portion of the flow during wet weather. Flows

averaged around 110,000 gallons per day in 1976 (7).

2.19 The Village of Beulah operates a sewage treatment plant on the southeast end of Crystal Lake. It consists of an Imhoff tank (primary treatment) followed by stabilization ponds and seepage ponds. The plant property is bounded on the west by the Betsie River at a position approximately one half mile east of the point of discharge from the Beulah treatment plant, although seepage water from the treatment ponds eventually enters the Betsie River channel by subsurface flow. However, the seepage ponds lack hydraulic capacity to handle present wastewater flows, and an interim discharge permit was granted the Village in late 1974 for semi-annual discharge into the Betsie River. The volume so discharged averages less than 5,000 gallons per day (7). The Frankfort plant and the Elberta plant are achieving treatment adequate for primary standards but cannot meet the standards which have been proposed for Lake Betsie which are (7):

	30-Day Average	7-Day Average
5-Day BOD	10 mg/l	15 mg/l
Total Suspended Solids	15 mg/l	25 mg/l
Fecal Coliform Bacteria	200/100 ml	400/100 ml
Plt	6.5 - 9.5	6.5 - 9.5
Total Phosphorus (P)	1 mg/l or 80% removal, which is greater.	

F. Harbor Sediment Quality

2.20 Information on the bottom sediments of Lake Betsie was obtained in 1972 and 1975. October 1972 sampling indicated that the sediments in the inner harbor of Lake Betsie near the channel to the outer harbor consist largely of blackish ooze and silt and contain excess quantities of volatile solids, COD, phenol, nitrogen (TKN), phosphorus, and oil and grease. The outer harbor and channel sediments were predominantly sand and low in deleterious substances (18, 19). In 1975, the inner harbor analyses confirmed that the bottom materials contain excessive quanitities of volatile solids, COD, and the other parameters named in the 1972 study, and in addition, excessive lead and zinc concentrations (20, 21 and Appendix 1.) Chlorinated hydrocarbon levels were not detected except for trace amounts of DDE. Phthalate concentrations were evident. In other 1975 studies, very heavy organic contamination and moderate to heavy contamination by heavy metals, including barium at one station, were found in the harbor sediments.

2.21 Effluents from the municipal wastewater treatment plants and

runoff into the Betsie River from its extensive basin would account for the bulk of the contaminants found in the inner harbor sediments. Commercial shipping vessels have likely contributed oil, grease and other residues in undetermined quantities. Lead and zinc are present in insecticides. Other sources in the drainage basin and fruit packing companies in Elberta and Frankfort are probable sources of these metals. Virtually none of the contaminant material comes from Crystal Lake. No additional significant point sources of contamination have come to light (7). Under the EPA Section 201 Facility Plan Program, design of new treatment facilities is in progress for Frankfort and Elberta to achieve such treatment of wastewater that it will be acceptable for discharge into Lake Betsie. The EPA has indicated that this measure would reduce the phosphorus load delivered to Lake Betsie by approximately 40 percent, which is expected to improve its trophic condition (7, 18).

G. Flood Hazard Area

2.22 The FIA Flood Hazard Boundary Map prepared for the City of Frankfort (June 4, 1976), shows flood hazard areas extending 100 to 200 feet inland of the north shores of Betsie Lake within the Frankfort corporate limits. The potential flood area remains south of Main Street and west of the shore road near the east corporate limits. The sites selected for confined disposal lie within the flood hazard area. Records with the Floodplain Management Section, MDNR, state the 100-year flood level for Lake Michigan near Lake Betsie is 583.8 feet. The 100-year water level in Lake Betsie would be strongly controlled by the Lake Michigan event (10, 16).

H. Currents

2.23 There are no published studies of the currents in Lake Betsie. The Betsie River is most likely the most significant producer of currents in the Frankfort inner harbor. There may be some water level changes in resonance with Lake Michigan seiches which would produce currents of short duration. There are probably changeable wind drift currents generated within Lake Betsie. The net flow of water in the inner harbor is northward and westward into Lake Michigan due to the discharge of the Betsie River. The westward drift of water is slow. The features of the inner harbor and shoreline are generally unrelated to significant current flow of water.

I. Climate

2.24 The climate of the Frankfort Harbor region is moderated over the year by the proximity of Lake Michigan, so that seasonal temperature variations are less extreme than at locations farther

inland. The growing season is roughly five months, which is around 15 days longer than average for the latitude.

2.25 Detailed weather data for Frankfort are not available. The U. S. Department of Commerce (Weather Bureau) maintains a climatological station in Manistee, Michigan, about 28 miles (45 km) south of Frankfort. Manistee records suggest that January temperatures average 23.4°F. (-4.8°C) in this area, and July temperatures average 69.1°F. (20.6°C). Extremely hot or severely cold days are rare for this latitude. Precipitation for the area averages 30.9 inches (80 cm). September is normally the wettest month, as moisture is picked up over Lake Michigan by the prevailing northwesterly winds and precipitated over coastal lands. Summer precipitation is mainly in the form of afternoon showers and thundershowers. Thunderstorms occur on an average of 31 days annually in this area.

2.26 Snowfall totals 66.4 inches (168.6 cm) during an average winter in this region. Frankfort is in the western Michigan snow belt, which is the result of prevailing westerly winds being warmed and becoming moisture-laden and unstable as they reach Lake Michigan's eastern shore. Cloudiness is greatest in late fall and early winter; sunshine percentages are greatest in the spring and summer (9, 10).

2.27 Five air quality monitoring stations lie within Manistee and Wexford Counties immediately south and southeast of Benzie County. These measure particulates, SO_2, and NO_2. Particulates in excess of 24-hour secondary standard limits (150^3 mg/m maximum) were noted in 1975 on only one occasion at one location - the Manistee Municipal Sewage Treatment Plant (11). This is a very local phenomenon. No other air quality standards were exceeded. The Frankfort Harbor Area is well-exposed to regional air masses and freshening frontal passages which tend to maintain high air quality. There are no significant uncontrolled discharges into the air in the region. Benzie County lies within the Environmental Protection Agency's Region V, which is investigated by EPA's Air Surveillance Branch. Benzie County is located in Air Quality Control Region 126 and classified with a priority III rating, denoting a relatively unpolluted condition (9).

J. Vegetation

2.28 Vegetation surveys were performed by Williams & Works Associates in July 1977. Old-field successional vegetation dominates the north shore of Lake Betsie at Site 4. These plant communities are characterized by introduced weed species and other vascular plants of disturbed areas.

2.29 Site 4 - Where buddings are not present there are willow

(Salix interior, S. amygdaloides, and S. glaucophylloides) thickets interspersed with herbaceous weed communities. These week communities are dominated by bull thistle (Cirsium vulgare), evening-primrose (Oenothera biennis), white campion (Lynchnis alba), goosefoot (Chenopodium Album), sweet clover (Melilotus alba), and hoary allyssum (Berteroa incana).

2.30 Site 9 - Parcel C of Site 9 is an old apple orchard. Over half the apple trees have died and fallen down. Besides apple trees (Pyrus molus), there are scattered trees and shrubs: white and black spruce (Picea glauca and Pmariana), elm (Ulmus americana), juneberry (Amelanchier spicata), black cherry (Prunus serotina), and staghorn sumac (Rhus typhina). Herbs and grasses include St. Johns wort (Hypericum perforatum), strawberry (Fragaria virginiana), hawkweed (Hieraceum aurantiacum), witch grass (Panicum capillare), black raspberry (Rubus occidentalis), star thistle (Centaurea maculosa), milkweed (Asclepias syriaca) cinquefoil (Potentilla erecta), pearly everlasting (Anaphalis margaritacea), hairy vetch (Vicia villosa), and sheep sorrel (Rumux acetosella). Parcel B is largely grass, but supports small trees and shrubs: staghorn sumac, black cherry, juneberry, elm, witch hazel (Hamamaelis virginiana), sugar maple (Acer saccharum), basswood (Tilia americana), and white ash (Fraxinus americana) and various herbs. Area A is vegetated primarily by grass and herbs. Staghorn sumac and black cherry are also present. All three areas support considerable moss cover. (see also Figure 9).

K. Fauna

2.31 Faunal surveys were performed by Williams and Works Associates in July 1977. Site 5 - The alder flycatcher (Empidonax traillii) and song sparrow (Melospiza melodia) were the only birds found in the willow thickets on this site. No nests were observed.

2.32 Site 4 - No species of wildlife were observed on these sites, which are constantly under disturbance from industrial or recreational activities.

2.33 The Betsie River marshes above the M-22 bridge between the Village of Elberta on the south shore of Lake Betsie and the City of Frankfort on the north, are nesting-brooding, rearing-feeding areas for the mute swan (Cygnus olor) and the Canada goose (Branta canadensis) (24). Both of these waterfowl species were seen with broods in these cattail (Typha latifolia) and bulrush (Scirpus spp.) marshes. Submerged aquatic plants, insect larvae, aquatic insects, crustaceans, and fish present in these marshes are the major food items for these birds. Local residents report that these birds frequent Lake Betsie in the late summer and fall.

2.34 Benthic invertebrate studies for the nearshore waters of Lake

Betsie adjacent to Site 4 have been conducted by the Michigan Department of Natural Resources (25, 26, and Appendix B). Tubificid worms (Oligochaeta) represented 75 percent to 86 percent of the benthic fauna in 1966, while midge larvae (Diptera) varied from 14 percent to 25 percent. Tubifcid worms formed between 81 and 99 percent of the 1975 survey, while midge larvae were between 1 and 19 percent. Organism densities from these shallow water (2 to 6 feet silt, organic detritus, and sludge sediments, showed only 9 minor change from 1966 to 1975, being approximately 900/square meter and 780 square meter, respectively.

2.35 On 30 October 1978, the U.S. Fish and Wildlife Service sampled Lake Betsie for fish within 100 feet of the shoreline at Site 4. The following species were present:

Lake Trout (Salvelinus namaycush)
Steelhead (Salmo gairdneri)
Brown Trout (Salmo trutta fario)
Rock Bass (Ambloplites repestris)
Northern Pike (Esox lucius)
Smallmouth Bass (Micropterus dolomieui)
Burbot (Lota lota)
Redhorse (Moxostoma anisurum)
Carp (Cyprinus carpio)
White Sucker (Catostomus commersoni)

From this sampling the Fish and Wildlife Service concluded that there was "a diverse population of fish species at the time.....". Forage fish species indicated "the presence of benthic and/or zooplankton organisms on which they feed". They also indicated that "the shallow waters provide potential spawning areas and needed nursery areas for fish fry". (See Appendix B).

2.36 The Betsie River is a designated trout stream. Lake trout (Salvelinus namaycush), brown trout (Salmo trutta), and steelhead trout (Salmo gairdneri) have been planted by the Michigan Department of Natural Resources in Frankfort Harbor. The 1974 MDNR stocking levels in Frankfort Harbor were 50,000 lake trout, 44,300 brown trout, and 35,000 steelhead. In 1978, 15,206 steelhead were planted in the Betsie River.

L. Cultural Elements, Aesthetics

2.37 Archaeological/Historical - The National Register of Historic Places (28) has been consulted and subsequent issues of the Federal Register checked. One historic site has been registered offically in Benzie County: the Mills Community House on Michigan Avenue in Benzonia. No districts, sites, buildings, structures, or objects significant in American history, architecture, archaeology, or culture recorded by the Secretary of the Interior are in the project area: nor have any sites in the project area been identified as eligible for inclusion in the Federal Register (13).

2.38 The State Historic Preservation Officer has reviewed the Draft EIS and foresees no cultural impact (See Appendix C). A telephone conversation with the State Archaeologist of 7 September 1979 indicated that severe disturbance from filling and construction activities at Site 4, and the soil type and distance from water at Site 9, make them unlikely areas for the presence of archaeological materials. There are no properties in the project area which are listed in Michigan's State Register of Historic Sites.

2.39 Population/Economy - Between 1950 and 1960, the population of Frankfort increased 5.3 percent from 1,605 to 1,690; between 1960 and 1970, the population declined by 1.8 percent to 1,660. Elberta Village has lost 1.8 percent of its population between 1960 and 1970, a decrease from 552 to 542. Crystal Lake, Gilmore and Lake Townships all gained population from 1960 to 1970 (13).

2.40 Lake Michigan and Lake Betsie endow the Frankfort-Elberta area with excellent boating and fishing opportunities. The recreational boating season on Lake Michigan extends from June through September, a period of about 120 days. The City of Frankfort has a newly completed marina suitable for servicing large pleasure craft. A public launching facility is located within the confines of the harbor area, and city docking facilities are available on the north shore of Betsie Lake. During 1976, a total of 752 cruisers and sailboats used the city docking facilities. Frankfort sponsors the American Salmon Derby from August 4 through September 15 along Lake Michigan. Sport fishing off the breakwaters in Frankfort Harbor is popular with both local and seasonal fishing enthusiasts. Until the early 1940's, the sport fishery, like the commercial fishery, was stimulated by lake trout abundance. Both fisheries have suffered the effects of overfishing, alewife competition, and lamprey predation. Restorative programs began in the 1950's with the application of selective poisions in lamprey spawning streams, and plantings of lake trout and other predator species (coho and chinook salmon and steelhead trout). Approximately 14 million trout and salmon were stocked in the Great Lakes and inland Michigan waters in 1971. Between 1972 and 1975, the Michigan Department of Natural Resources planted 60,294; 244,675; 35,145; and 10,044 steelhead in the Betsie River (13).

2.41 Commercial vessel traffic at Frankfort Harbor consists almost entirely of railroad car ferries, a few locally-based fishing craft, and an occassional self-unloading lake freighter. During the 14-year period, 1961 through 1974, waterborne commerce at Frankfort averaged 1,419,543 tons per year. Freight traffic has been steadily decreasing over the past four years to the 1974 figure of 801,645 tons, which is less than half the 1970 traffic of 1,632,508 tons (13). The States of Wisconsin and Michigan are currently subsidizing the Ann Arbor Railroad Ferry and no plans have been made to terminate its operation.

It is the highest priority railroad ferry service on Lake Michigan and would be the last to be terminated. The Ann Arbor Railroad also expects a 50% increase in tonnage carried through Frankfort Harbor. Since it did not join other rail companies in a recent 7% rate increase.

2.42 A breakdown of freight commodities at Frankfort in 1977 indicates the predominance (by tonnage) of lumber, pulp, paperboard, paper, paper products, and basic chemicals. A majority of these transported items were received from other Great Lakes ports. In 1972, 37 percent of in-and-out-bound waterborne vessels utilizing Frankfort Harbor were 15 feet in draft, 49 percent were 17 feet in draft, and 2.6 percent were 18 feet in draft (13). In 1977 82% of the vessels had a draft of 17 feet, which require an inner harbor depth of 18 feet. The Ann Arbor Railroad Ferry used one vessel in 1977, "The Viking", which drew 17 feet 9 inches maxiumum. The vessel "City of Milwaukee" began servicing Frankfort on 21 November 1978. It has a maximum draft of 17 feet 10 inches. Maintaining the 18 foot inner harbor project depth is justified by the high percentage of use by 17 foot draft vessels. The following is a table of 1977 commercial vessel calls by draft at Frankfort.

Commercial Vessel Calls by Draft - 1977
Inbound/Outbound

Draft (feet)	Passenger and Dry Cargo	Tanker	Towboat or Tugboat	Total
20	1/0			1/0
19		3/0		3/0
18	0/1			0/1
17	454/454	3/0		457/454
16			1/1	1/1
15			2/2	2/2
12 and Less	93/93	2/5		95/100
TOTAL	548/548	8/5	3/3	559/556

The latest year of record for recreational vessel calls is 1976.

Recreational Vessel Calls by Draft - 1976

Draft (feet)	Cruisers	Sailboats
6 and greater		11
5		313
4	64	4
3	185	
2	161	
1 and less		
TOTAL	424	328

Maintenance of the 10 foot project depth within the Recreational Anchorage area is justified because wave surges caused by car-ferry traffic necessitate a minimum depth of 10 feet to provide safe clearance for moored recreational craft, especially sailboats. This depth is also consistent with the depths provided at other recreational harbors.

2.43 Existing Land Use - There is no residential development adjacent to the proposed transfer and disposal sites. Scattered residential development is present along the transfer route. A number of commercial and industrial buildings exist near Site 4. Immediately north of Site 4 is the eastern edge of the Frankfort Central Business District. A senior citizens center has recently been established near the northern edge of the disposal site.

2.44 Site 4 is presently not being used. Immediately east of Site 4 are a city garage, the C.J. Kiffy Memorial Launching Facility, and the city sewage treatment plant.

2.45 Site 9 is located in the Fife Lake State Forest. The Forest is used for recreation purposes.

2.46 Man-made Facilities and Activities - The major highway transportation routes that serve Frankfort are Michigan routes 115 and 22. M-115 traverses the state in a northeast to southeast direction and connects with major north-south routes.

2.47 Utilities in the area include water, gas, sewer, electricity, and telephone services.

2.48 Environmental Use or Management Areas - There are four environmental use or management areas near Frankfort. Approximately 20 miles north of Frankfort is the Sleeping Bear Dunes National Lakeshore. The Betsie River is a State designated natural river which feeds Betsie Lake. The Fife Lake State Forest is approximately 10 miles south of Frankfort and the Manistee National Forest is approximately 40 miles south of Frankfort.

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2.50 Environmental Use or Management Areas - There are four environmental use or management areas near Frankfort. Approximately 20 miles north of Frankfort is the Sleeping Bear Dunes National Lakeshore. The Betsie River is a State designated natural river which feeds Lake Betsie. The Fife Lake State Forest is approximately 10 miles south of Frankfort and the Manistee National Forest is approximately 40 miles south of Frankfort.

3. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

3.01 The City of Frankfort has a land use plan and zoning ordinance in effect. The dredging disposal site, Site 4, has been planned and zoned for parks and recreation (27).

Mr. C. A. Frederickson, City of Frankfort superintendent, stated in a 23 January 1979 letter to the Corps of Engineers, that, at Site 4 "the present grade requires fill to make possible ultimate use as an expansion of our waterfront, Mineral Springs Park. Water's edge treatment compitble with existing shoreline work between Fifth and Seventh Streets, would make possible expansion of our Frankfort Municipal Marina."

3.02 Disposal Site 9 is owned by the State of Michigan and is within the Fife Lake State Forest. Planning and management of the area are governed by State Forest regulations. The dredged material will add fertilizer to the covered areas, resulting in good plant growth. There is no known conflict of the proposed action with existing land use plans.

4. PROBABLE IMPACT OF THE PROPOSED PROJECT ON THE ENVIRONMENT

A. General

Section 404 of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) requires that the Corps of Engineers apply to its own projects the same criteria used in evaluating projects requiring a dredge or fill permit. These criteria include evaluation under 40 CFR 230, an Environmental Protection Agency Regulation, and an adequate opportunity for public review and comment on projects. 40 CFR 230 requires that any proposed plan involving placement of fill material into navigable waters must take into account the effect this action will have on wetlands, water quality, benthic organisms, fisheries and shellfish beds (including spawning and breeding areas), wildlife, recreation, municipal water supply intakes and threatened and endangered species. Effects of the project fill activities upon these aspects of the environment are evaluated in Section 4, except for shellfish production, on which there would be no effect. The 404 items are marked with an asterick (*).The fill material of concern would be dredged material deposited in Lake Michigan in an approved open water disposal site, or would be a part of the diked disposal facility which would extend up to 10 feet into Lake Betsie.

4.01 Inner harbor sediments, which are unsuitable for open water disposal, will be dredged into a shallow draft scow. The scow will be unloaded at one of two locations at the immediate north shoreline of Betsie Lake. An access channel will be dredged to allow the scow

to reach a convenient point near the shoreline for unloading. At Site 4, 40,000 cubic yards of materials will be confined. The remainder of the 114,4000 cubic yards will be trucked to Site 9 in Fife Lake State Forest.

4.02 The use of Site 4 will require placement of two pile clusters for anchoring of the scow near the southwest corner of the site. The southwest 200 feet of the confined disposal area will be sheet piled on the south face (facing Betsie Lake) and a transfer platform extended lakeward from the dike in order to permit access to the scow by unloading equipment.

4.03 The diked area will be constructed of core material of graded granular material and will be lined with clay and plastic liner seals. The south face of the diked area, west of the sheet piled portion, will be riprapped with light armor stone. The south dike wall of Site 4 will be at an elevation of 586.8 feet. 10 feet above Low Water Datum. It would extend as far as 10 feet into Lake Betsie.

4.04 The following discussion addresses the foreseen impacts of the construction and utilization of the lakeshore site. A small area of bottomland would also be filled in by the dike (see Figure 2).

B. Wetlands*

4.05 No wetlands occur at Site 4 along the shore of Lake Betsie.

C. Vegetation

4.06 Submerged Vegetation - Existing submerged pondweed vegetation offshore from the shoreland site will be removed during construction of the access channel to Site 4. This will result in loss of aquatic flora and associated snails and immature insects. This vegetation would otherwise function as shelter for fish in the area, provide food for the invertebrate communities, and serve as spawning habitat and shelter for the larval fish ultimately produced from spawning. The submerged vegetation which would be removed is not unique to the Frankfort Harbor area.

4.07 Upland Vegetation - Disturbance vegetation in the form of old field successional weed communities and willow thickets occupies the shoreland area. An adverse effect from removal of the vegetation would result from utilization of Site 4. The vegetation will be entirely removed. This vegetation functions as habitat for alder flycatchers, song sparrows, and possibly other songbirds in the Site 4 area. It probably also serves as food or cover for small mammals such as rats (Cricetidae), squirrels and chipmunks (Sciuridae), and rabbits

(Lagomorpha). The (weedy) vegetation which would be removed is not unique to the Frankfort Harbor area.

4.08 Topographic changes during construction and operation at the site would result in alteration of the surface runoff patterns into Lake Betsie. Sedimentation patterns would be changed only to the extent of the usrface runoff diversion. The shoreland site is not an area of prime natural recharge or storage for storm or floodwater.

4.09 Existing herbaceous vegetation at Site 9, Fife Lake State Forest, would be covered by approximately 6" of dredged material which would subsequently be disced into the present sandy topsoil. This would kill most of the existing herbs, but have little effect on the shrubs and trees in the area.

4.10 The addition of a much richer, more organic topsoil and immediate reseeding would improve the vegetational productivity of the area. Present areas of sparse vegetation would be eliminated. Successional processes would be accelerated: the presence of aspen (Populus Sp.) and mixed hardwoods in the open disposal areas would be expected sooner than if the disposal did not take place. Percentage cover by mosses would be reduced.

D. Water Quality*

4.11 Scow unloading by crane and clamshell near the shoreline may involve some accidental spillage. The impact of spillage is expected to have only local significance as a stress on biota, because the near-shore ambient water is turbid. An oil skimmer and weir will be used to control the return of water to the lake, and splash pads and other necessary devices will be used to minimize erosion. Contractors will be instructed to perform in compliance with appropriate portions of the Michigan Inland Lakes and Streams Act 346 of 1972 and the Michigan Soil Erosion and Sedimentation Control Act 347 of 1972 in all phases of construction and operation. These Acts limit increases in sediment load and other adverse water quality effects from construction.

4.12 The sediments to be dredged contain excessive quantities of volatile solids, chemical oxygen demand, phenol, nitrogen, phosphorus, oil and grease, plus excessive levels of lead and zinc. Site 4 will be lined with clay to prevent seepage of separated water. The skimmer placed in the containment area will remove oil and grease from the surface so that clear water with insignificant amounts of deleterious substances will be returned to the lake. The overflow will be monitored at control overflow points to be certain that no excessive concentrations go undetected. Should

concentrations be found to be unsafe or unsuitable for release into Betsie Lake, material within the containment areas would be treated. Suspension of sediments during access and maintenance dredging would result in a temporary release of chemical constituents and solids contained in the sediment (See Appendix A). Their removal, however, would prevent the future release of nutrients or toxic materials into Lake Betsie waters. Fewer nutrients would improve the trophic condition of the waters. At Site 9, no effects on water quality could be expected because of the distance from Betsie River and Deer Creek, the sandy soils, flat topography, and surrounding vegetation.

E. Vectors

4.13 The shallow nearshore areas of Lake Betsie already furnish places of breeding for insect pests. This being so, the project activities, including the temporary ponding of water in the disposal site, should have a minor additional impact on the area. However, should unusual insect problems develop as a result of the project, these can be controlled with biodegradable insecticides, ponding control measures, or with suitable cover.

F. Air Quality

4.14 There would be local odors at the transfer, confinement and forest sites. However, these would be temporary and not significantly different from the existing shore area atmosphere caused by large exposure of surface water and existing dredged fill along the shoreline. Site 9 is in an isolated area so the temporary odors could have no significant effect.

G. Benthos

4.15 Benthic fauna would be removed from the access channel and maintenance dredging area. All sessile benthic organisms inhabiting the dredged areas would be destroyed by the proposed work. Lake Betsie is a culturally eutrophic environment in which the benthic environment is dominated by turbificid worms and highly organic detrital and sludge sediments. Bottomland and benthic organisms adjacent to the proposed access channel would be buried with sediments. Waters in the area would increase in turbidity during construction and a temporary local depletion and simplification of the food chain could result. A small area of habitat would be filled in by the south dike wall of the disposal facility.

4.16 Monitoring of overflow waters would be performed to be certain that potentially harmful concentrations are not released.

H. Fishery Resources*

4.17 Panfish spawning, breeding, rearing and feeding habitat would be destroyed in the access channel dredging. As the nearshore bottom sediments are highly organic, and only marginally suitable as nesting territory for such fish as the bluegill, sunfish and pumpkinseed, the loss of suitable habitat would be minimal. Spawning habitat of the black bullhead, shallow water with a heavy cover of submerged vegetation, would be removed. Other fish utilizing the area for feeding or cover would be displaced during construction and operation.

4.18 The Schedule for maintenance dredging and dredging of the access channel would be adjusted to avoid potential impacts on spawning or migration of lake trout, brown trout or steelhead. These species have been planted at the mouth of the Betsie River and could utilize rocky areas in Lake Michigan (lake trout) or sandy or gravelly areas upstream in Lake Betsie (brown trout or steelhead).

I. Wildlife*

4.19 Areas sometimes frequented by alder flycatchers and song sparrows would be destroyed at Site 4. At Site 9, wildlife using the open fields would initially be eliminated. After disposal and replanting, the area would support more wildlife because of the increased productivity of the soil.

J. Recreation*

4.20 Public fishing in Lake Betsie would be locally restricted during the dredging of the access channel to Site 4.

4.21 During the construction and operation phases, bird watching would be restricted along the shoreline at Site 4.

4.22 No permanent detrimental effect on the potential recreational use of the area would occur; rather, following 2 years of the 10-year operation period, Site 4 would become part of the City of Frankfort's shoreline development project. It would enhance the recreational value of the land for the city and its visitors. The recently established Senior Citizens Center would receive increased noise and dust during construction and disposal but would ultimately be benefitted by being adjacent to the park.

4.23 The access channel dredging would provide better accommodation of recreational boats in nearshore fishing waters.

4.24 The shoreline of Lake Betsie within the project area is in a disturbed condition. The scenic quality of this part of the shoreline would be improved by the action proposed at Site 4 following completion of the project.

4.25 At Site 9, after revegetation, the disposal site areas would support additional wildlife for observation or hunting.

K. Socio-Economic Effects

4.26 Short-term economic benefits from increased employment would be realized in the local area during construction and during the scheduled dredging disposal periods.

4.27 The location of construction and transfer equipment at Site 4 would have only slight adverse visual effects on the aesthetics of the harbor, considering the industrial characteristics of the north shoreline of Lake Betsie.

4.28 No property tax base would be lost to local governments from the use of Site 9, since the State Forest disposal site is now publicly owned and is tax exempt. Acquisition by the City of Frankfort of Site 4 has removed, the property from the ad valorem property tax base.

4.29 Truck traffic on state and local roads between Site 4 and the State Forest disposal site would significantly increase traffic. The roads would be maintained at the level of repair when use of the constructor began. The roads would be maintained during hauling operations and left in the condition existing prior to the commencement of such operations.

4.30 Dredging an access channel for scow unloading at Site 4 would provide improved access to this site for vessels requiring up to 6 feet of depth.

4.31 Filling and improvement of Site 4 as a recreation area would have long-term recreational benefits.

4.32 The noise generated by equipment at the transfer site and by trucks along the transfer route may have a minor adverse effect on users of the nearby boat launching site and park, on commercial establishments near the transfer site and on populations near and adjacent to the transfer route.

L. Flooding

4.33 The floodplain project area is related directly to the level of Lake Michigan. The project would be constructed on the 100-year floodplain, but the top of dikes would be well above that level (586.8 feet vs. 583.8 feet) and no potential problems are envisioned. The construction of the confined disposal facility (CDF) has been examined for conformance with Executive Order 11988. Although it is recognized that the proposed CDF would be located within a previously determined flood hazard area, future use of the CDF for recreation would not be incompatible with the flood potential nature of the area. Furthermore, because the surrounding area is heavily developed, the presence and proposed use of the CDF would not be expected to induce development incompatible with the floodplain designation. It would have no effect on the floodplain elevation in Lake Betsie.

Based on the advantages and disadvantages of floodplain sites and non-floodplain sites, no practicable alternative location for the CDF exists. It would also provide further flood protection for the area directly north of it.

M. Commercial Fishing *

4.34 No commercial fishery exists in Frankfort Harbor.

4.35 Migration patterns of fish in the Betsie River would not be jeopardized by the access channel dredging, as it would take place in shallow nearshore water aside from the main flow through Lake Betsie. Lake trout are mainly coldwater spawning species; they would not be likely to utilize Lake Betsie for spawning or migration. Brown trout, and steelhead, which are late fall and early spring spawners, respectively, would be expected to utilize areas of fine gravel and rocks upstream in the Betsie River.

N. Threatened and Endangered Species*

4.36 No endangered or threatened plant or animal species listed in the Federal Register 14 July 1977 or subsequently, has been reported for this shoreline area or for Fife Lake State Forest. The extensive and intensive disturbance of the area would preclude use by those species of shoreline and raptorial birds which frequent the shorelands of the Great Lakes.

O. Municipal Water Supplies*

4.37 The nearest public water supply intakes in the project area are one-quarter mile north of the Lake Betsie northern shoreline. The public water supply is obtained from the ground in a location protected by overlying clay and by the natural gradient of groundwater flow, which is lakeward. The distance, gradient, and ground materials would isolate dredged materials from the aquifer. Therefore, there would be no impact upon municipal water supplies. The nearest private water supplies are all obtained from the ground and adequately isolated from the project by the prevailing movement of groundwater in the region. No project effects would therefore be expected on private wells.

P. Summary of Beneficial and Adverse Effects and Mitigating Measures

4.38 Beneficial impacts include:

(1) Upon project completion, the confined disposal area (Site 4) would be used as a park site in coordination with an adjacent city-owned marina and launching site.

(2) Upland confinement of contaminated sediments would be beneficial to the trophic condition of Lake Betsie and Lake Michigan. It would also increase biological productivity in the Site 9 areas of Fife Lake State Forest.

(3) There would be increased local employment during construction and operation of the confinement facility.

(4) The necessary dredging of a shallow access channel to the shoreline at Site 4 would enhance access for recreational vessels requiring up to 6 feet of draft.

(5) Maintenance of harbor structures and project depths would maintain the harbor for commercial and recreational use, and use as a harbor of refuge.

4.39 Adverse impacts include:

(1) Noise due to construction traffic and placement of cluster and sheet piling would affect users of the

exiting marina and park and Main Street businesses, and would have a minor impact on residences on Forest Avenue, one block north of the project site. The noise impact of pile driving will be mitigated by use of short stroke, fast acting, diesel hammers.

(2) A minor increase in truck traffic would be expected from the disposal area at 9th Street along Main Street and M-22 to M-115. About one truck every 10 minutes could be expected. Minor increases in dust and noise would be anticipated, but would be minimized by contract specifications. The haul route is through an industrial area and would have minimal effect on residences and commercial establishments.

(3) There is a potential for dust generation in the construction area. It would be kept to a minimum by wetting down the area.

(4) Construction of access channels to the shoreline would result in minor losses of panfish and bullhead spawning, rearing and feeding grounds. There would also be destruction of benthic organisms and habitat in the outer and inner harbor project areas from maintenance dredging activities and temporary decrease in water quality due to turbidity.

(5) Construction of the diked facilities would result in total and permanent removal of vegetation, consisting of old-field weed communities, from Site 4.

(6) There would be an insignificant impact upon urban residences or commercial-industrial areas from hauling materials from Sites 4 to Fife Lake State Forest Site 9.

(7) Potential release of harmful concentration of contaminating substances at controlled overflow points at the diked facilities would be minimized through settling out of solids in the confined area, skimming, and discharge water and groundwater quality monitoring programs. A further mitigating feature would be the clay and plastic liner seals at Site 4 to prevent leaching of contained waters.

(8) Temporary ponding within the diked area could create breeding areas for mosquitoes. Should this

occur, draining and other devices would be used to suppress the breeding.

(10) The possible threat of food chain concentration of potentially harmful substances, which would begin with the estblishment of successional vegetation in the confined sites, can be mitigated by an analysis of the settled dredge material and covering if desirable with inert fill. Use of Site 4 as a landscaped park following the project period is a further mitigating measure.

(11) Maintenance of structures would temporarily reduce water quality, affect fishing, and inconvenience users of the harbor.

Q. Conformance to Regulations Concerning Confined Disposal Facilities; Water Quality Act of 1977

4.40 The proposed confined disposal project is in conformity with existing zoning laws. Construction and operations will be in compliance with the Michigan Inland Lakes and Streams Act 346 of 1972 and the Michigan Soil Erosion and Sedimentation Control Act 347 of 1972, and Public Law 92-500, which regulates surface water discharges.

4.41 An ecological evaluation has been made in this section of the EIS following the evaluation guidance in 40 CFR 230.4 in conjunction with the evaluations considered in 40 CFR 230.5 (40CFR 230.3 (d)). Appropriate measures have been identified and incorporated in the proposed plan to minimize adverse effects on the aquatic environment as a result of the discharge. (40 CFR 230.3(d)). Consideration has been given to the need for the proposed activity, the availability of alternative sites and methods of disposal that are less damaging to the environment, and such water quality standards as are appropriate and applicable by law. (40 CFR 230.5). Other site or construction alternatives are not practicable, and the proposed fill and the activity associated with it will not cause permanent unacceptable disruption to the beneficial water quality uses of the affected aquatic ecosystem.

4.42 The discharge sites for Maintenance Dredging, Confined Disposal, Structure Repair, and Operations, at Frankfort Harbor, Michigan have been specified through the application of the Section 404(b) (1) Guidelines.

4.43 Section 401 Water Quality Certification has been obtained from the State of Michigan (see Appendix C).

R. Conclusions

4.44 The project will have no major long-term adverse environmental impacts. Some short-term adverse impacts will occur during construction, maintenance and operation. However, the long-term economic benefits of re-use of the project site for marina and park purposes, the shore-term economic benefits resulting from increases in local employment during the construction and operation phases, and the improved approach to the shoreline effected through access dredging, outweigh the adverse effects, not considering the primary purpose of the project, making possible use of the harbor by commercial and recreational vessels. These uses will make major contributions to the regional economic health and development of the Frankfort Harbor area.

5. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

5.01 Unavoidable adverse impacts of construction include increases in road traffic and noise, destruction of existing marginal panfish and bullhead habitat, and elimination of upland weed communities from the confined disposal site.

5.02 Dredging and maintenance of harbor channels would result in temporarily increased turbidity, suspended solids, undesireable alterations of water quality. Dredging to project depths would continue to disturb benthic communities as long as the project is maintained.

6. ALTERNATIVES TO THE PROPOSED ACTION

6.01 The proposed action involves the periodic repair of harbor structures, and maintenance and backlog dredging of the Frankfort, Michigan, Federal Navigation Channel by the U. S. Army Corps of Engineers, as authorized by Congress. This involves the removal of the shoaling sediments and disposal of the dredged materials into open water at the 18 foot contour or into confined disposal facilities when they are unsuitable for open lake disposal.

6.02 Alternatives to the proposed disposal method are: (1) disposal of all sediments in open water, (2) confined disposal of all materials, (3) pretreatment of materials, (4) dredging methods, and (5) changes in project dimensions. Consideration of economics, engineering, irretrievable resources, and minimal ecological distruption, indicates that confined disposal for sediments unsuitable for open water release offers the best alternative at the present time. The ultimate solution depends on adequate control of upland erosion and reduction in contaminants from municipal and commercial discharges.

A. Open Water Disposal

6.03 Open water disposal is the least costly alternative but is in conflict with present practices of the Detroit District Corps of Engineers and with a request made by the Governor of Michigan to discontinue disposal of unsuitable dredged material in the open lake water. In addition, the Environmental Protection Agency has stated that most of the material is unsuitable for open lake disposal. EPA Regulation 33 CRF 209.145 states a policy prohibiting open water disposal of such sediments.

B. Alternative Diked Disposal Sites

6.04 Ten (10) sites were considered for confined disposal. A site selection committee consisting of members representing the U. S. Fish and Wildlife Service, the U. S. Environmental Protection Agency, the U. S. Army Engineer District (Detroit), and the Michigan Department of Natural Resources, conducted the inquiries leading to final site selection. This process began in late 1974. The sites are shown in Figure 1.

6.05 Sites 1, 2, and 3 on the south shore of Betsie Lake are unacceptable because they are valuable wetlands and goose nesting areas. The Fish and Wildlife Service objected strongly to use of inland industrial Site 6 because part of the site is wetland. Use of Sites 7 and 8, attached to the existing harbor breakwater, would disturb fishing from the breakwater. There was also no local support for these sites.

6.06 Site 10, a private parcel located between the channel south pier and breakwater, also failed to receive local support.

6.07 Based on environmental, economic and operational considerations, Site 4 was selected as the most sound of the lake area sites. Site 4 is owned by the City of Frankfort. The EPA anticipated no adverse impacts from use of this site for confined disposal. The Fish and Wildlife Service found Site 4 acceptable for disposal if a stone dike were used on the Lake Betsie side and if the entire structure were to be extended no further than 10 feet beyond the existing shoreline.

6.08 Three areas in the Fife Lake State Forest have been selected as Site 9 (see Paragraphs 1.26 through 1.29).

6.09 Site 5 was considered for temporary storage of dredged materials at a time when the city was in the process of trying to acquire Site 4. Settled sediments would then have been hauled to Site 9 for permanent disposal. Because of immediate and long-term community benefits from recreational use of Site 4, use of Site 4 and 9 was selected instead of Site 5. The cost of the use of Sites 4 and 9 is also lower.

C. Pretreatment

6.10 Treatment of dredge material could be accomplished in several ways: (1) local sewage treatment works; (2) separate onshore treatment plants; (3) on-board treatment prior to in-lake discharge.

6.11 Assuming the removal of a moderate amount of dredgings, i.e., 1,000 cubic yards of material per day, a 0.5 percent slurry would be a volume equivalent to the wastewater discharge of 0.25 million people. Existing sewage treatment plants do not have the capacity to treat these additional volumes. Costs for new treatment plants are prohibitive and chemical treatment to settle the suspended solids is expensive. In addition, chemical flocculation in conjunction with open lake disposal could cover lake bottoms with sediments unsuitable for biological production.

D. No Action Alternative

6.12 If maintenance dredging was not undertaken, continuous shoaling of the channel would eventually impede the movement of recreational and commercial traffic. It would also deny usage of Frankfort as a harbor of refuge. Existing and planned public and private harbor facilities would become useless when the channel no longer could provide safe and adequate navigation. Area businesses dependent on distant and lcal boater commerce would suffer. The Ann Arbor Railroad Ferry, the most important railroad ferry on Lake Michigan, would be forced to shut down. This would affect the railroad.

6.13 If structures were not maintained, there would be loss of commercial and recreational use, loss of a harbor of refuge, and eventual cluttering of the harbor with the delapidated structure components.

6.14 In terms of economics, practicality, irretrievable resources, and minimal ecological disruption, confined dike disposal of sediments unsuitable for open water disposal offers the best solution at the present time. Continued maintenance dredging and structure rehabilitation also are preferable to no Federal action.

E. Dredging Methods, Project Area, and Dredging Depths

6.15 The harbor could be dredged either by clamshell or by hydraulic dredge. However, State Forest disposal requires clamshell dredging to obtain dryer material. The two methods are comparable with respect to their environmental effects on water quality and on local biology.

6.16 Present commercial and recreational usage of the harbor justifies maintenance of present project dimensions and depths (see Section 1). Neither increasing or decreasing the depths would be advantageous at this time.

7. RELATIONSHIP BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7.01 Upland confinement of deredged sediments which are unsuitable for release into open waters contributes to long-term improvements in the trophic condition of Lake Betsie and Lake Michigan. After 2 years of the ten year project period, the confined disposal facility at Site 4 would be developed as a recreational park consistent with the City of Frankfort's overall development program for the Lake Betsie shoreline. There would be a long-term reduction of benthic productivity in the dredged areas due to periodic disruption of biological processes.

8. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES WHICH WOULD BE INVOLVED SHOULD THE PROPOSED ACTION BE IMPLEMENTED

8.01 Commitments of labor, materials, fuel and equipment will be required in construction and operations.

8.02 Marginal quality panfish and bullhead bottomland will be eliminated uring construction of the access channel.

9. COORDINATION

A. Public Participation

9.01 The Frankfort Harbor disposal site selection committee consists of members from the Corps of Engineers, the Michigan Department of Natural Resources, the U. S. Fish and Wildlife Service, and the U. S. Environmental Protection Agency.

9.02 Coordination included meetings with various officials from the City of Frankfort and the Village of Elberta, and the Benzie County Planning Commission. A public workshop was held at Frankfort High School on September 6, 1976, discussing previous decisions, the description of the project, and environmental impact. Suggestions were received from the audience and audience opinion was solicited on site alternatives and other matters. There was little or no concern expressed about the enviornmental effects of the project. Public notices for maintenance dredging and the diked disposal facility were issued on 16 February 1979 and 5 January 1978, respectively (see Appendix C).

B. Government Agencies

The following government agencies have been contacted for information in the preparation of the environmental impact statement:

(1) Michigan Department of Natural Resources

(2) U. S. Fish and Wildlife Service

(3) U. S. Environmental Protection Agency

(4) State Historic Preservation office
Michigan History Division

C. Citizen Groups

The following citizens group was contacted for information in the

preparation of the Draft Environmental Impact Statement:

(1) West Michigan Environmental Action Council

9.03 Comment and Response - Comments on the Draft Environmental Impact Statement and responses to the comments follow. Comment letters are found in Appendix C.

UNITED STATES DEPARTMENT OF COMMERCE
ASSISTANT SECRETARY FOR SCIENCE AND TECHOLOGY

Comment 1

This is in reference to your draft environmental impact statement entitled, "Confined Disposal Facilities, Dredging, Structure, Repairs and Operations, Frankfort Harbor, Michigan." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving eight (8) copies of the final statement.

Response

Eight copies of the final environmental statement will be mailed to you as requested.

GREAT LAKES ENVIRONMENTAL RESEARCH LABORATORY

Comment 2

Maintenance dredging of Frankfort Harbor and maintenance of the harbor structures will, in our opinion, produce no long-term impacts on Lake Michigan. Either one of the two selected sites on the shore of Betsie Lake for the interim disposal of polluted spoil and the ultimate disposal of that spoil in the State forest is acceptable.

Response

Thank you for your comments.

NATIONAL OCEAN SURVEY

Comment 3

On page 2-7, paragraph 2.26, the recent high level should read 581.04 feet, vice 581. The recent low level should read 575.35 feet, vice 575.38. The dates cited are correct. Also, page 16, first paragraph, change 2.23 feet to 2.21 feet.

Response

The appropriate changes have been made, please refer to paragraph 2.13 page10.

Comment 4

Geodetic control survey monuments may be located in the proposed projected area. If there is any planned activity which will disturb or destroy these monuments, NOS requires not less than 90 days' notification in advance of such activity in order to plan for their relocation. NOS recommends that funding for this project includes the cost of any relocation required for NOS monuments.

Response

Prior to the start of any work, all geodetic control survey monuments in the project area would be located. Precaution would be taken so as not to disturb any of the monuments. However, if the project would impact on a monument, the suggested procedures for notification of NOS would be carried out.

FEDERAL ENERGY REGULATORY COMMISSION

Comment 1

Comments of this office are made in accordance with the National Environmental Policy Act of 1969 and the August 1, 1973 Guidelines of the Council on Environmental Quality. Our principal concern with this development is its effect on bulk electric power facilities including potential hydroelectric developments and on natural gas pipeline facilities.

Since the above noted proposed project apparently would pose no major obstacle to the construction of such facilities, we have no comments on the Draft EIS.

The statements are of this office and do not necessarily represent the views of the Federal Energy Regulatory Commission.

Response

Thank you for your comment.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Region V

Comment 1

We have completed our review of the Draft Environmental Impact Statement (EIS) for the proposed confined disposal facility, dredging, structure repairs and operations at Frankfort Harbor, Michigan which was sent to us with your letter of October 20, 1977. Based on infor-

mation presented in the EIS and our September 27, 1977, visit to the site of the proposed confined disposal facilities, we have no major objections to the proposed activities, but request additional information for a complete assessment. We offer the following comments for your use in preparing the Final EIS.

Response

Thank you for your review and comments.

Comment 2

Our Agency finds use of sites 4 (the Bureau of Outdoor Recreation property), 5a (Luedtke property), and 9 (the Fife Lake State Forest) acceptable for dredged sediment disposal at Frankfort Harbor. But it should be noted that the sediment analysis for Frankfort Harbor indicated that sediments contain high levels of lead and zinc. Consequently, measures to mitigate water quality impacts and monitoring procedures should be designed to adequately protect against contamination by those pollutants.

Response

Site 5A is no longer being considered for use. The receiving waters offshore of Site 4 would be monitored by the Corps for water quality. If a problem arose, the appropriate measures would be taken to eliminate the source of the problem or bring the situation within acceptable standards. No special measures would be required for adequate protection against contamination in Fife Lake State Forest. Cation exchange capacities of such typical sandy soils are high enough to absorb zinc and lead present in concentrations several orders of magnitude higher than present in the dredged material that would be applied and tilled into the Fife Lake State Forest soil. (Knezek, B. D. and R. H. Miller, eds., "Application of Sludges and Wastewaters on Agricultural Land: A Planning and Education Guide", Ohio Agricultural Research and Development Center Research Bulletin 1090, Wooster, Ohio, October 1976.) The areas to contain dredged materials are surrounded by vegetation. They are one-half mile to 1 mile from streams (the Betsie River and Deer Creek). They are also in flat areas of the State Forest. The sandy soils of the area would rapidly absorb runoff from the disposal areas.

Comment 3

If lead and zinc remain attached to the fines in the sediment, the sand filter at Site 4 should be adequate; however, if the pollutants are converted to salts, they may be released with the CDF effluent and a liner may be required along with appropriate remedial measures to achieve water quality standards. The Final EIS should address

potential chemical reactions which could occur during dredging and disposal operations and which may allow lead and zinc to be converted to salts. We request the opportunity to review the monitoring procedures that will be used at Frankfort and recommend that a series of pipes be incorporated into the dike design at Site 5a to accomplish testing of the effluent. It should be indicated in the Final EIS who will assume responsibility for monitoring the confined disposal facility effluent and what parameters will be tested and how frequently. We recommend the following monitoring procedures:

> The following parameters are basic and easy to run in the field. They can be used to control the sampling program and detect changes immediately: temperature, specific conconductivity, pH and turbidity. Suspended solids should be run to determine the efficiency of the sedimentation process in the disposal area. Ammonia should be run because it can be toxic, a nutrient and is the compound most likely to leach from the spoil in easily detectable quantities. Chlorides and sulfites should be run because they are soluble, conservative and can be used as tracers for the plume. Additional parameters should be selected based on the results of the bulk sediment or elutriate analysis of the original spoil. If bulk sediment concentrations exceed the following values, the parameter should be run:

TKN	2000 mg/kg	Manganese	500 mg/kg
Phosphorus	650 mg/kg	Arsenic	8 mg/kg
Lead	60 mg/kg	Cadmium	6 mg/kg
Zinc	200 mg/kg	Chromium	75 mg/kg
Cyanide	0.25 mg/kg	Barium	60 mg/kg
Iron	25,000 mg/kg	Copper	50 mg/kg
Nickel	50 mg/kg		

> Or if elutriate test results exceed the following values, the parameter should be included:

Cyanide	0.01 mg/l	Lead	5 ug/l
Phenol	50 ug/l	Zinc	25 ug/l
Arsenic	5 ug/l	Hg	0.5 ug/l
Cadmium	1.0 ug/l	TKN	5 mg/l
Copper	10 ug/l	Phosphorus	.05 mg/l
Iron	500 ug/l		
Manganese	500 ug/l		

> The bulk sediment values are based on over 250 samples from Great Lakes harbors collected during 1974 and 1975. The elutriate values are based on 48 samples collected during 1975.

Parameters which are consistently below the level of detectability in the first 5 samples may be discontinued.

Response

Site 5A is no longer being considered for use. A six inch layer of bentonite is planned which would act as an impermeable liner at Site 4. A series of wells for obtaining leachate samples will also be incorporated into the design of the facility at Site 4. Samples obtained will be analyzed for the following parameters during dredging operations:

Temperature	Lead
pH	Zinc
Turbidity	Barium
Suspended Solids	Phenol
Total Kjeldahl Nitrogen (TKN)	Volatile Solids
Total Phosphorus	Iron
Oil and Grease	Chemical Oxygen Demand (COD)

The effluent would also be monitored for these parameters. Effluent from Detroit District disposal sites is usually sampled at two week intervals. After repeated absence of levels of sensitivity, sampling takes place at greater intervals. This practice would be maintained at Site 4 by the District.

Comment 4

Macroinvertebrate samples should be collected in the receiving waters before the discharge starts and again near the end or immediately after the discharge ceases. This will detect and document any effects that the discharge may have had on the benthic community of the receiving waters.

Response

The macroinvertebrate community would be sampled after construction and within one or two years of initial disposal of dredged materials.

Comment 5

In addition, vegetation produced at the Fife Lake State Park property should be monitored for intake of pollutants. As previously conveyed to your staff, U. S. EPA's publication on "Application of Sewage Sludge to Cropland: Appraisal of Potential Hazards of the Heavy Metals to Plants and Animals" should be helpful in determining the best condition for disposal at the State Forest. The potential for smothering existing tree roots by placement of spoil and erosion of the sediment should be addressed in the Final EIS. Planting should

be planned as soon as possible to mitigate sediment erosion.

Response

The suggested reference and an EPA sponsored conference publication, "Recycling Municipal Sludges and Effluents on Land" indicate that there is no real reason for concern about food-chain contamination, for the following reasons:

> Human food chains are not involved; there will not be repeated applications; and retention in the soil of high levels of toxicity compared to concentrations in the disposal material. As indicated in the EIS, only 6" of soil would be applied. Since it would be largely silt and tilted into the soil, there should be little concern over root smothering; there are also very few trees to be concerned about. Seeding would take place soon after disposal of materials at Site 9 to reduce erosion. Erosion would be insubstantial because of flat topography, sandy soils, and surrounding vegetation.

Comment 6

At the time of our site visit at Frankfort Harbor, it was not certain whether the railroad car ferry service was going to continue. The current status of the ferry service should be included in the Final EIS.

Response

The states of Wisconsin and Michigan are currently subsidizing the Ann Arbor Railroad Ferry. No plans have been made to terminate ferry service. The Frankfort Harbor ferry is the highest priority railroad ferry on Lake Michigan, so it would be the last to be terminated. The Ann Arbor Railroad did not join other rail companies in a recent 7% rate increase. As a result of its relatively cheaper rates, it expects a 50% increase in total tonnage carried through Frankfort Harbor. The status of the ferry service has been described in Section 2 of the FEIS.

Comment 7

The old sediment guidelines used by U. S. EPA should be eliminated from the document (page 1-17) or their proper historical perspective explained. The new sediment guidelines now used by U. S. EPA should be presented in full including page 1 (copy attached).

Response

The appropriate revisions are present in the final environmental impact statement. Refer to Appendix 1.

Comment 8

The U. S. EPA should be included as a member of the Site Selection Committee referenced on page 42.

Response

The omission has been corrected.

Comment 9

As indicated in the above discussion and in accordance with EPA's procedures, we have classified our comments on the proposed CDF and maintenance operations as LO, lack of objection, and rated the Draft EIS as Category 2, additional information required. The date and classification of our comments will be published in the Federal Register. Thank you for the opportunity to review the subject document. If you have any questions about our comments, please contact Ms. Barbara Taylor of my staff at 312/353-2307. Please send us two copies of the Final EIS when it is filed with the Environmental Protection Agency in Washington, D.C.

Response

The additional information required has been added to the final environmental impact statement.

SAINT LAWRENCE SEAWAY DEVELOPMENT CORPORATION

Comment 1

Reference is made to NCEED-ER 20 October 1977 transmittal of the Draft EIS's for maintenance dredging of the following harbors and waterways:

Les Cheneaux Islands, Michigan
St. Joseph Harbor, Michigan
Frankfort Harbor, Michigan
Port Austin Harbor, Michigan

SLSDC has reviewed the subject EIS's and has no comments to offer. Thank you for the opportunity to examine these documents.

Response

Your review and comment are appreciated.

Comment 1

We have determined that the use of Site 4 for the construction of a four-acre confinement facility could constitute a conflict with Section 6(f) of the Land and Water Conservation Fund Act of 1965. As proposed, the Site 4 facility would be located entirely within an area (totaling approximately 6.5 acres in size) that has been approved for acquisition with assistance from the Land and Water Conservation Fund to expand the Mineral Springs Park and Marina (Projects 26 - 00741 and 26 - 00893). These projects were approved by the Lake Central Region, Bureau of Outdoor Recreation, on July 16, 1976, and February 11, 1977, respectively.

Response

The use of Site 4 would not constitute a conflict with this Act. The City of Frankfort acquired the site, with the assistance of the Bureau of Outdoor Recreation, and is proposing to expand its Mineral Springs Park into this area. The site needs to be filled to be compatible with the existing park. The construction should be completed within 2 years for the City to be in compliance with BOR (now Heritage Conservation and Recreation Service) guidelines. The use of this site would be in furtherance of the existing land use plan of the city.

Comment 2

If Site 4 is unavailable, the draft statement mentions that Site 5A will be used as a temporary confinement facility. This site would be situated adjacent to the 10th Street Boat Launching Park, which was developed with assistance from the Land and Water Conservation Fund (Project 26 - 00126). Therefore, any permanent or temporary taking of land from the park during construction of the proposed earthen access road from the existing 10th Street right-of-way to site 5A would conflict with Section 6(f) of the Land and Water Conservation Fund Act of 1965. As amended, Section 6(f) reads:

> No property acquired or developed with assistance under this section shall, without the approval of the Secretary, be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonable equivalent usefulness and location.

We request that the Army Corps of Engineers coordinate the above matters with Mr. O. J. Scherschligt, Deputy Director, Michigan Department of Natural Resources, Box 30028, Lansing, Michigan 48909.

Response

Site 5A would not be used for this project.

Comment 3

4.D. Water Quality - Bottom sediments in the project area have been classified as unsuitable for open-water disposal owing to excessive quantities of volatile solids, COD, phenol, nitrogen, phosphorus, and oil and grease, plus excessive levels of lead and zinc (page 31, paragraph 4.12). In order to reduce any adverse effects on water quality within the harbor that may result from dredging operations, measures such as silt screens should be used to locally control the migration of the turbidity plume which may contain hazardous concentrations of polluted materials.

Response

Monitoring of turbidity levels of the surrounding water would be carried out during dredging operations. Turbidity levels would be made to conform to conditions that would not in injurious to any designed use of the waterway. Based on conditions that have proved to be harmful, the Corps of Engineers has established a turbidity limit of 50 Jackson Candle Units (JCU) above ambient water conditions at a distance of 500 feet from the operations. Should a problem arise, operations would cease until the cause of the problem has been eliminated or at least mitigated.

Comment 4

6.B. Alternative Diked Disposal Sites - In Section 6.07 (page 43), the draft statement mentions that Site 4 is owned by the Bureau of Outdoor Recreation (BOR). This statement is incorrect and should be replaced with one indicating that the BOR has approved Land and Water Conservation Fund projects for the acquisition of this area by the City of Frankfort to expand Mineral Springs Park and Marina.

Response

The suggested correction has been made, please refer to the revised paragraph 6.07 page 32.

Comment 5

9.B. Government Agencies - We note on page 46 that the State Historic

Preservation Officer (SHPO) was contacted for information during the preparation of the draft statement, but no indication of the results of this consultation has been provided. The environmental impact statement should include documentation of consultation with SHPO and contain a copy of her comments on the proposed action.

Response

The letter of comment from the State Historic Preservation Officer has been included in this final environmental statement, please refer to Appendix C.

Comment 6

To comply with the policy set forth in Section 1(3) of Executive Order 11593, all areas to be affected by the proposed project--including all proposed disposal areas and any borrow areas to be used for construction materials--should be professionally examined for archeological remains. Any archeological sites identified should then be evaluated with reference to the criteria for listing on the National Register of Historic Places (36 CFR 800.10).

Response

The State Historic Preservation Officer has received the project and has determined that it would have no impact on cultural resources. A telephone discussion of the State Historic Preservation Officers rationale for indicating no cultural impact was held with the State Archaeologist, Dr. John Halsey on 7 September 1979. The presence of refuse materials from the surface to depths of from 4.9 to 15.0 feet in Corps soil borings at Site 4, indicates a history of severe disturbance which would disqualify site 4 as a potential site of archaeological significance (See boring logs, Appendix B, Revised Letter Report for Diked Dredged Disposal Area, Frankfort, Michigan, December 1978). Dr. Halsey also indicated that because of the distance of Site 9 from water, and the nature of the soils in the area, there is a low probability of finding any archaeological site in the State Forest disposal area. It was agreed that there exists no archaeological justification for conducting a reconnaissance at either site.

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION
Region 5

Comment 1

In the summary of adverse effects and other parts of the statement, it is noted that increases in dust and noise due to construction as well as increases in traffic congestion are expected. Truck access routes will need to be constructed at Site 4 as well as improved from M-115 to the Fife Lake State Forest disposal site. Interim handling, dewatering and truck hauling are proposed and a railroad crossing is affected. The effects of truck traffic on the State and local roads are considered unavoidable and short-term. We believe some mitigation of these adverse effects should be considered since they are significant and especially since they will affect traffic in the business district. We, therefore, recommend the State and/or local road agencies be consulted and the statement address the mitigation measures which can be implemented to minimize the adverse impacts to traffic congestion, noise and dirt due to construction operation in this area.

Response

The draft EIS was incorrect with respect to the hauling route. At the disposal site trucks would leave from Ninth Street, proceed down Main to M-22, then from M-22 to M-115. This route is east of the commercial district and the area is largely industrial in composition. The increase in traffic would be slight; 1 truck would pass out of the disposal/loading area approximately every 10 minutes. Noise, dust, and dirt would be limited to inoffensive levels through contract agreements. The contractors would have to leave roads in as good condition as when they began using them. Any road improvements made in the project area would be maintained until the contract is complete.

Comment 2

It is also recommended the statement address the impacts associated with disposal Site 9 such as anticipated odors, the effect of truck hauling and the extent of improving and maintaining the small access road in the forest area. The condition of this road and the nature of the improvement including its environmental effects as well as the responsibilities for maintenance should be considered.

Response

No significant odor is expected at the Fife Lake State Forest Site. The disposal areas are broad open areas with very few trees and sandy

soils. The access road in question is a two rut trail. Improvements necessary for access and disposal would consist only of grading. No significant environmental effects would be expected from access construction in this area. The road would be maintained at the improved level through completion of the project.

UNITED STATES DEPARTMENT OF AGRICULTURE
Forest Service

Comment 1

We believe that some planting program should be applied to Site 5A if it is used, even if it is not used as a landscaped park like Site 4.

Response

Site 4 has been selected as the disposal/transfer area.

Soil Conservation Service

Comment 1

The Soil Conservation Service in cooperation with the City of Frankfort and the Michigan Department of Natural Resources, Waterways Division, has a Resource Conservation and Development measure currently under construction. This measure is designed to stabilize the eroding bank of Lake Betsie in the city marina between Fifth and Seventh Streets. This is adjacent to proposed disposal Site #4. The dredging project should be carried out in such a manner so as not to cause additional erosion hazards or endanger the erosion control measures currently being installed. If Site #4 is used for disposal, the containing dike should be installed in such a manner as to be compatible with the erosion control measures being installed.

Response

According to an 8 June telephone conversation with Jerry Keller, of the SCS East Lansing office, the measure is complete. Interference could only be expected from undercutting of the measure due to disposal activities. Review of plans of the completed project provided by Mr. Keller suggest that this would not occur because of the extent of protection of both projects at the land-water interface and the erosion control measures which would be carried out at Site 4. Thank you for your review of the EIS.

9.04 Coodination under Section 404, Clean Water Act of 1977 - A Public Notice and Preliminary Evaluation under Section 404 of the Clean Water Act of 1977 were issued in January 1980. After a 15 day review period four comment letters were received (See Appendix F for the Notice, Evaluation, comment letters and replies.)

9.05 Three of the comment letters (U.S. EPA, U.S. Fish and Wildlife Service, and Michigan United Conservation Clubs) concerned the possibility of impacts on fisheries, specifically impacts on spawning or migration which could result from dredging, disposal, or construction of the confined disposal facility. Fisheries information obtained by the U.S. Fish and Wildlife Service which was not presented in the context of the 404 evaluation was presented in the Draft Environmental Sttement and will be found in Sectin 2 and Appendix B of the FEIS. Dredging schedules are routinely coordinated on an annual basis with the Michigan Department of Natural Resources, U.S. Fish and Wildlife Service and the U.S Environmental Protection Agency to minimize possible impacts of fisheries. The yearly review allows utilization of the latest fisheries information from each harbor. The dredging schedule at Frankfort would thus be adjusted to minimize impacts on fish spawning and migration.

9.06 The comment letter from the Michigan United Conservation Clubs questioned the benefits of placing the contaminated materials in a confined disposal site near the lake edge. In response, it was noted that this would avoid placing the contaminated materials in open water where they could be disseminated and either contribute to eutrophication or allow toxic materials to enter the food chain. The shoreside facility would be lined with bentonite or other materials to prevent leakage into the groundwater or the lake (See FEIS, page 23, Subsection D., Water Quality.) The use of the selected site would also provide recreational benefits and avoid the trucking of dredged materials through downtown Frankfort.

Michigan United Conservation Clubs also questioned the necessity for dredging the access channel to Site 4 if other upland disposal alternatives exist. Based on technical, social, economic, and environmental considerations, the use of Site 4 in conjunction with Site 9 proved to be the best alternative for confinement of contaminated dredged materials (See FEIS, Section 6, Alternatives to the Proposed Action, page 31a).

9.07 The fourth comment letter (Stephen Zetterberg) requested the use of uncontaminated dredged materials for beach nourishment along the shore of Lake Michigan north of the breakwater to compensate for erosion due to the presence of the breakwater and "dumping of Betsie dredging in deep water". It is planned to dispose of clean dredged materials along the Lake Michigan shore north of the breakwater to help alleviate beach erosion (Final Environmental Statement, Mitigation of Shore Damage Attributed to the Federal Navigation Structures at Frankfort Harbor, Michigan, U.S. Army Engineer District, Detroit, Michigan, September 1976).

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GLOSSARY

Accretion - Natural or artificial buildup of land by the action of air or water deposition.

Aerobic - Any biologic process which requires oxygen to function.

Anadromous - Type of fish that ascend rivers from the sea (or lake) to spawn.

Anaerobic - Any biologic process which does not require oxygen to function.

Aquatic Plants - Plants rooted in the substrate that grow in water, either floating on the surface, growing up from the bottom of the body of water, or growing under the surface of the water.

Aquifer - A hydraulically continuous volume of the ground water which yields useful quantities of water to wells.

Artificial Nourishment - The process of replenishing a beach by artificial means.

Baymouth Bar - A bar extending partially or entirely across the mouth of a bay.

Benthic - Relating to the bottom of a stream, lake, or harbor.

Benthos - Bottom dwelling organisms; uniformly applied to animals associated with substrates.

Biomagnification - Increasing accumulation of a substance (such as mercury) from organism to organism in the food chain.

BOD - Biochemical Oxygen Demand. A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water.

Breakwater - A long narrow (rubble mound) pile of rock, concrete or wood; a structure in the water designed to break or moderate the effect of storm driven waves. Usually placed out into the water from shore at an entry channel to provide safer boat or ship navigation during stormy weather.

Carrying Capacity. - Sustained use (or production) of the land without environmental degradation.

COD - Chemical Oxygen Demand. The amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water.

Coliform - Any of a number of organisms common to the intestinal tract of man and animals, whose presence is an indicator of pollution.

Conductivity (Specific Conductance) - A measure of a solution's capacity to convey an electric current.

Coriolis Effect - The tendency of moving air masses to change direction continuously in response to the earth's rotation.

Dike - A mound of earth, sand, clay or other substance on land or in the water designed and built to confine materials.

Dissolved Solids - The total amount of dissolved material, organic and inorganic, contained in water or wastes.

DO - Dissolved Oxygen. The oxygen freely available in water. Unpolluted water will contain more DO than polluted water.

Dredge, Clam-Shell - A barge mounted crane with a split-bucket or clam-shell suspended from it, powered by steam or diesel, which operates by dropping its clam-shell to the bottom by gravity where it is closed and lifted, along with the sediments it catches, from the bottom by wire cables. Generally used for dredging soft sediments, sand and gravel.

Dredge, Hydraulic - A barge or ship mounted vacuum suction device, sometimes fitted with an "eggbeater" type cutter head, powered by steam or diesel, which operates by breaking up the sediments with the rotating cutter head and may pump the material from the bottom through pipes to a discharge point at some distance from the equipment, in the water, on land or into a confinement facility. Generally used for dredging muck, soft sediments or sand. Operates with about 20% solids and 80% water.

Dredge, Ponar - A bottom sediment sampling device which operates similar to a clam-shell dredge. Usually used to sample soft muck, sand and fine gravel sediments and associated benthos during aquatic surveys.

Dredging - A method for deepening and widening streams, swamps or coastal waters by scraping and removing solids from the bottom to restore the authorized depths in the established projects.

Ecotone - The edge between two or more different communities (e.g., the transition between forest and grassland).

Endangered Species - A species of plant or animal which is in danger of extinction throughout all or a significant part of its range.

Environmental Impacts - A phrase used to express the extent or severity of an environmental effect; the impact.

Eutrophication - Natural processes which result in water quality reduction via nutrient enrichment. Eutrophication over time changes open lakes to swamps and eventually to dry land.

Fauna - The animals, terrestrial or aquatic, of a region.

Fecal Coliform - A group of organisms common to the intestinal tract of man and of animals.

Flora - The plants, terrestrial or aquatic, of a region.

Food Chain - Energy transformations - Movement of food from one form of life to another; for example, algae to zooplankton to fish.

Foredune - That zone of shoreland immediately inland of the beach and the result of windblown sediment deposition.

Granular - Sand and/or gravel in composition referring to sediments.

Ice Ages - The late Pleistocene Epoch, a period of time which ended in Michigan approximately 8,000 years ago and which was marked by glaciers and extensive raising and lowering of the Great Lakes levels.

Impermeable - Able to confine water without any seepage.

Interface - The point at which two substances, such as water and bottom sediments, come together.

Leach - To remove a substance by water filtration or percolation.

Littoral - The shallow waters that extend along the shoreline of a lake or sea.

Littoral Drift - The sediments moved in the littoral zone under the influence of waves and current. Direction of movement or "transport" of littoral materials depends upon wind and wave direction.

Longshore Current - Somewhat similar to littoral drift.

Low Water Datum - LWD. An approximation to the plans of mean low water that has been adopted as a standard reference plane.

Marsh - A wetland dominated by herbaceous vegetation; primarily sedges, reeds, and grasses.

Monitoring Program - To study the amount of pollutants present in the environment.

Mooring Facility - A place where a ship, barge, or scow is fastened.

Moraine - Glacial till, or sediments deposited directly from ice.

Nekton - Aquatic organisms (larger than zooplankton) which swim freely in the water.

Nutrient - Elements or compounds essential as raw materials for organism growth and development; for example, carbon, oxygen, nitrogen, and phosphorus.

Organic - Material derived from organisms; leaves, sticks, animals, fish, etc.

Outwash - Sediments deposited directly from glacial meltwater streams or lakes.

Percolate - Downward movement or infiltration of water through the pores or spaces of rock or soil.

Permeable - Able to allow water to seep through.

pH - A measure of the relative acid or alkaline state of water. pH is measured on a scale of 0 to 14. A pH of 7 is neutral, a pH below 7 is acid, a pH above 7 is alkaline. Rainwater is usually slightly acid.

Phenols - A group of organic compounds that in very low concentrations produce a taste and odor problem in water.

Phosphorus - An element that while essential to life, contributes to the eutrophication of lakes and other bodies of water.

Phytoplankton - The algae of the open water of lakes, rivers, and streams.

Phytosociology - The study of plant associations.

Piers - Permanent structures constructed of stone, steel, cement or a combination of those materials, which are used to define and stabilize entry channels from the open lake into a harbor.

Rare Species - An extremely uncommon species limited in distribution.

Riprap - A layer, facing or protective mound of stones randomly placed to prevent erosion, scour, or sloughing of a structure or embankment; also the stone so used.

Scow - A barge equipped with trap-doors in its bottom which is used for moving and dumping dredge spoil.

Sediments - Clay, sand, gravel or stones which have been eroded from the land or from beneath the water, have been transported by river or lake currents, and re-deposited.

Seiche - Fluctuations above or below "normal" water level in a basin caused by wind, barometric pressure or a combination of both — resulting in a rise or fall on shore over a period of hours.

Sheet Steel Piling - Interlocking lengths of steel driven into a stream, lake or harbor bottom next to the shore to prevent storm, wave or ship damage.

Shoal - A place where water is shallow, sometimes created by a sandbar, in the shipping channels, created by deposition of eroded material.

Silt - Finely divided particles of soil or rock. Often carried in cloudy suspension in water and eventually deposited as sediment.

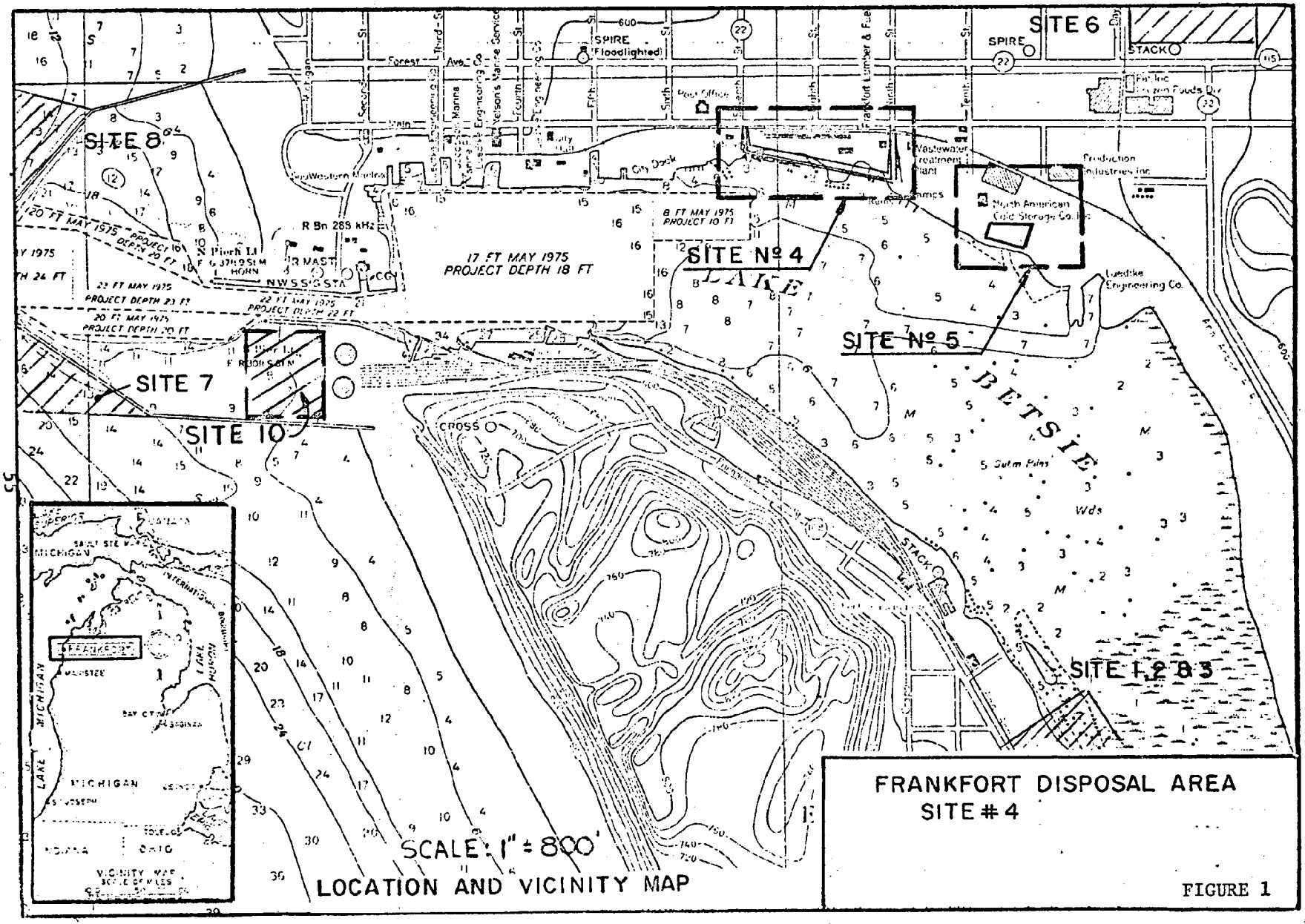
Spoil	- Sediments which have been dredged from beneath the water.
Staging Area	- Major concentrations of waterfowl or shorebirds occurring on certain lakes and ponds during spring and fall migration.
Succession	- The change in species composition from initial colonizing organisms to members of a diverse stable community.
Surface Water	- Atmospheric water that runs off to collect in streams, ponds, lakes, swamps, marshes, etc.
Terrace	- A level area marking a period of constant lake water elevation.
Terrain	- The general natural setting of the land surface of an area as imparted by a particular geological process.
Threatened Species	- A species which is likely to become endangered because of low reproductive capacity, loss of suitable habitat or over-kill, now limited in numbers to few isolated populations.
TKN	- Total Kjeldahl Nitrogen. A measure of the ammonia and organic nitrogen, but does not include nitrite and nitrate nitrogen.
Tombolo	- A sand or gravel bar connected from shore to an island or off-shore structure.
Topography	- The configuration of the landscape including its relief, the position of its natural and man-made features.
Trophic	- Food chain relationships in an ecosystem.
Turbidity	- A cloudy condition in water due to the suspension of silt or finely divided organic matter.
Visual Vulnerability	- The sensitivity of the landscape to accommodate a given use (e.g., a disruption of natural landscape features).
Volatile Solids (Total)	- A measure of the organic material that could decompose and thus exert an oxygen demand on a body of water.
Wave	- A ridge, deformation, or undulation of the surface of a liquid.
Wetland	- Habitats characterized by aquatic or semi-aquatic plants that are permanently wet, or intermittently water covered.
Zinc	- Zinc (Zn) is a heavy metal which in trace quantities is essential to life, but which in greater quantities may be toxic to life.
Zooplankton	- Animal microorganisms living unattached in the water.

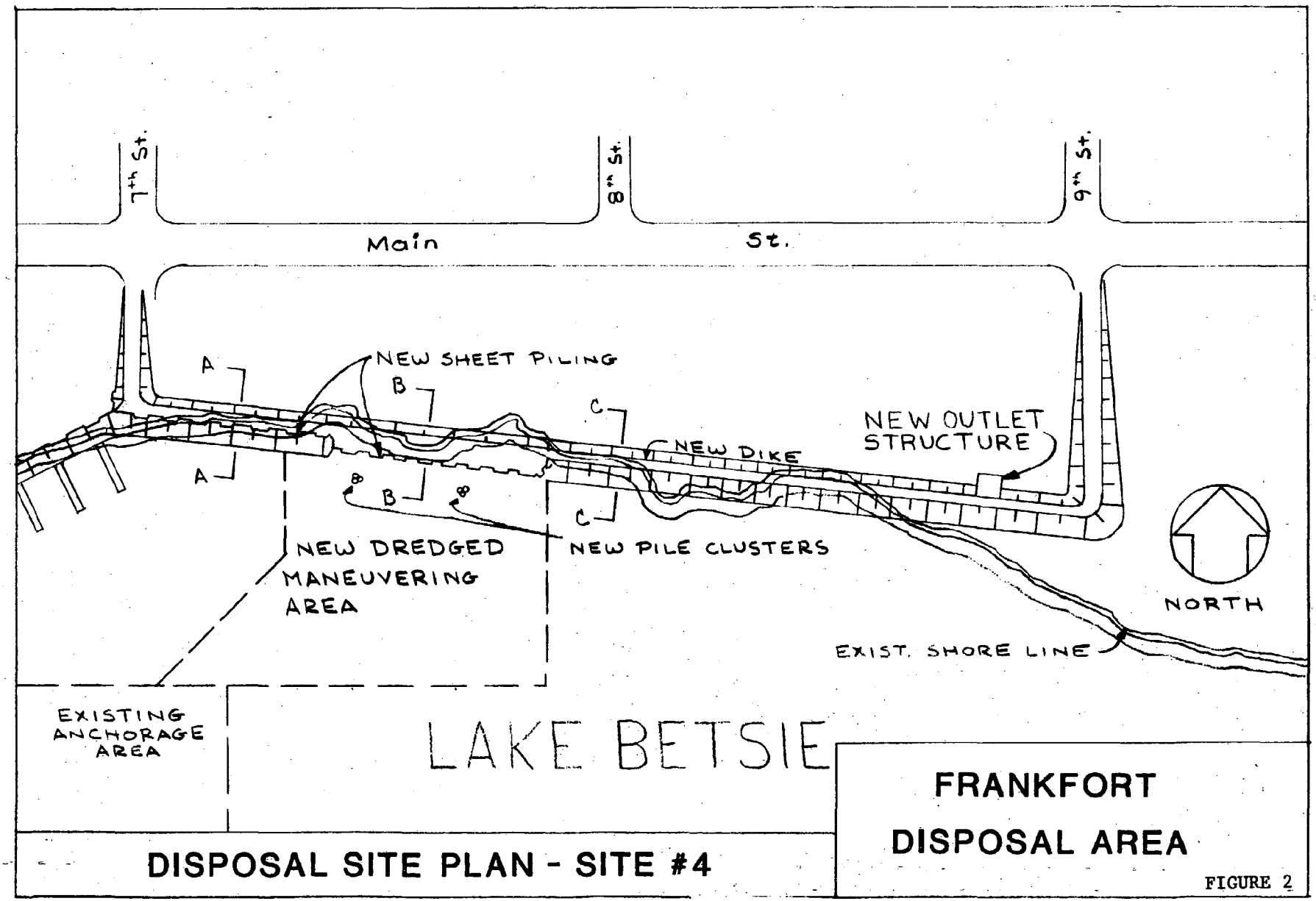
TABLE 1. WATER QUALITY FOR MUNICIPAL WELLS AT FRANKFORT AND ELBERTA, MICHIGAN
(Source: Michigan Department of Public Health, Nov. 1974)

CHEMICAL PARAMETER (mg/l)	FRANKFORT WELL #		ELBERTA PUMP DISCHARGE WELL #		1962 PHS DRINKING WATER STANDARDS
	#1	#2	#1	#2	
Bicarbonate-$CaCO_3$	180	-	230	168	
Calcium-Ca	68	54	74	43	
Carbonate-	0	-	0	0	
Chloride-Cl	12	5.7	13	2.0	250
Fluoride-F	0.27	-	0.17	0.11	-
Hardness	260	-	305	175	-
Iron-Fe	<.05	<.05	<.05	0.65	0.3
Magnesium-Mg	27	22	26	21	
Manganese-Mn	<.01	<.01	<.01	0.04	0.05
Nitrate-NO_3 as N	1.7	2.6	0.65	1.63	45
Potassium-K	1.0	0.97	1.4	0.78	
Silica-SiO_2	11.5	10.3	11.5	7.7	
Sodium-Na	6.8	29	13	2.8	80
Sulphate-SO_4	70	-	81	4.7	250
Total Solids	323	233	379	198	500
pH	7.6	7.5	7.5	7.7	-

Frankfort Well #1 Location: 504 Beech Street
Frankfort Well #2 Location: City Park, 317 Day Avenue
Elberta Pump Discharge Wells #1 and #2 Locations: M166 at George Road

a) From Table 8, Mitigation of Shore Damage Attributed to the Federal Navigation Structures at Frankfort Harbor, Michigan, Final Environmental Statement, The U.S. Army Engineer District, Detroit (September, 1976).

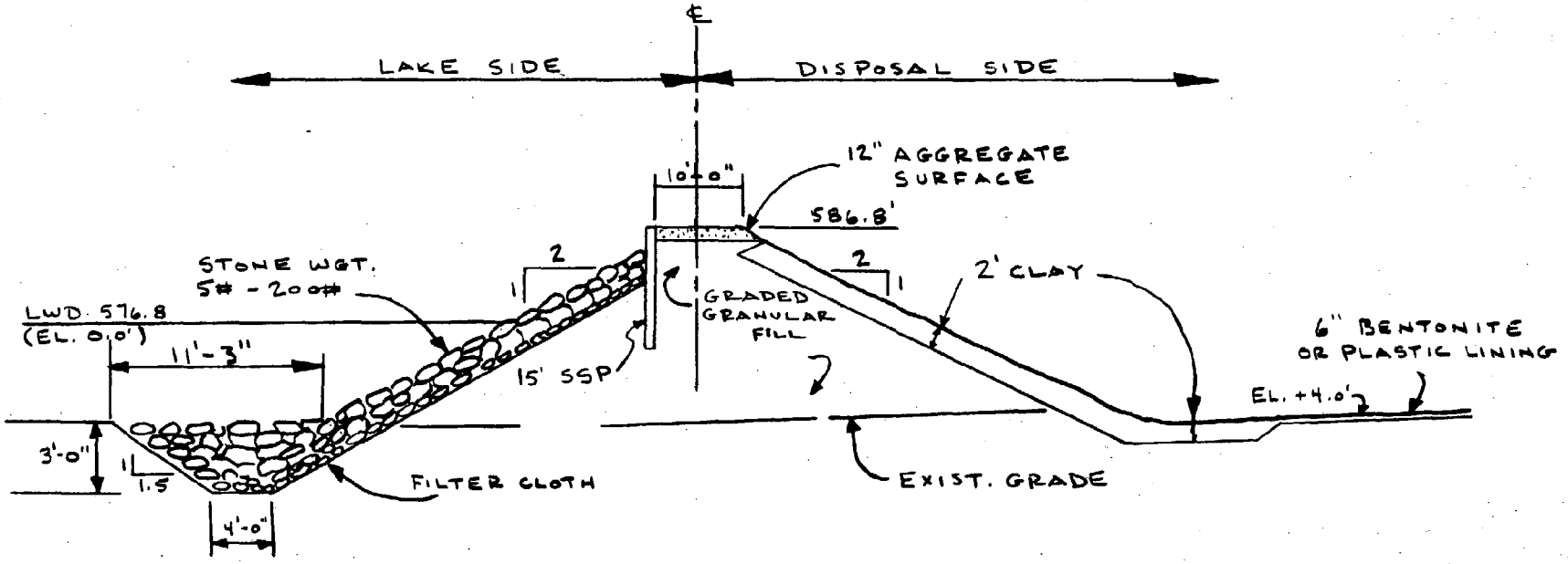

SITE 6
SITE 8
SITE 7
SITE 10
SITE Nº 4
SITE Nº 5
SITE 1, 2 & 3
LAKE
MICHIGAN
17 FT MAY 1975
PROJECT DEPTH 18 FT
SCALE: 1" = 800'
LOCATION AND VICINITY MAP
FRANKFORT DISPOSAL AREA
SITE # 4
FIGURE 1



DISPOSAL SITE PLAN - SITE #4

FRANKFORT DISPOSAL AREA

FIGURE 2



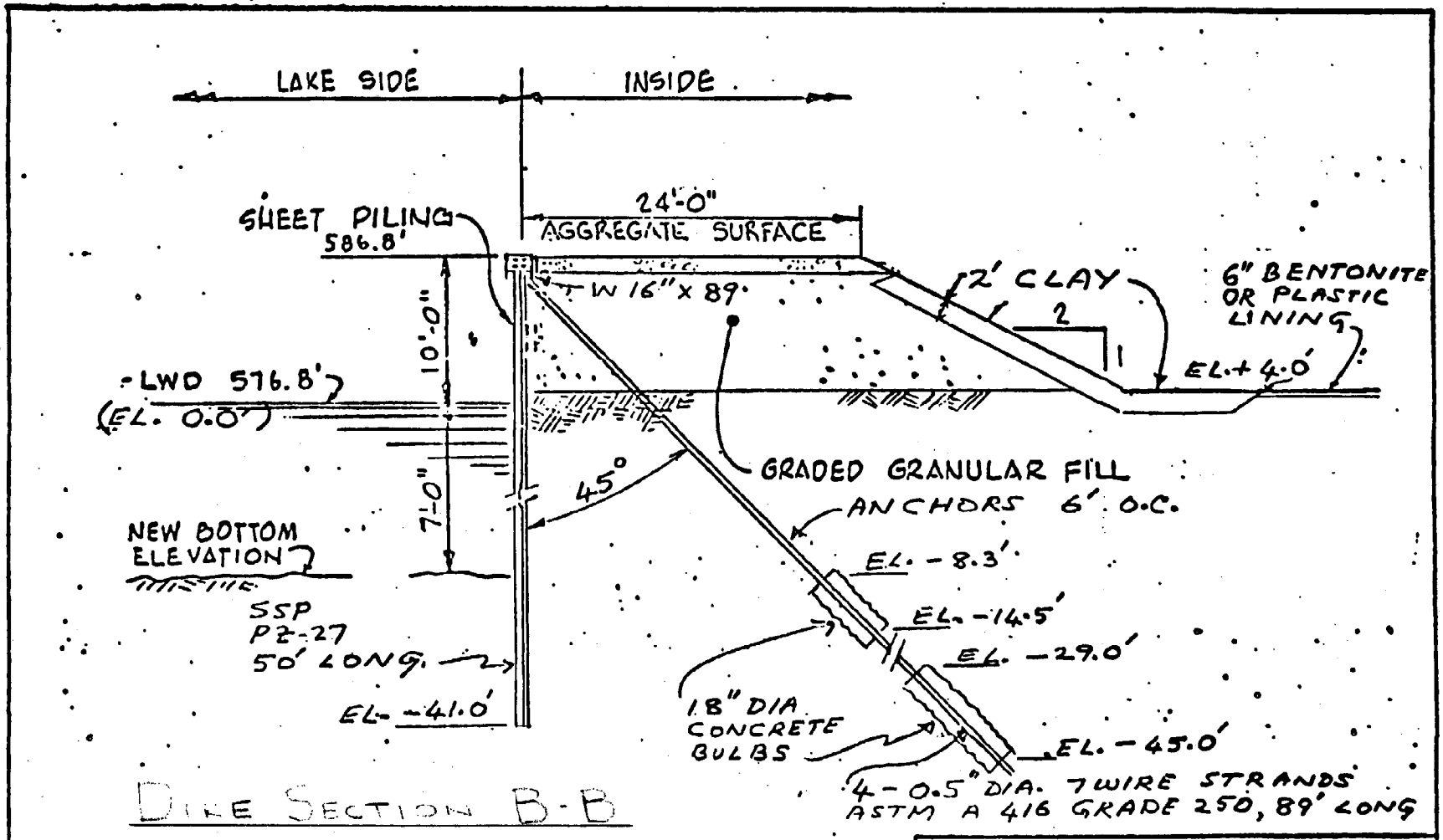
DIKE SECTION A-A

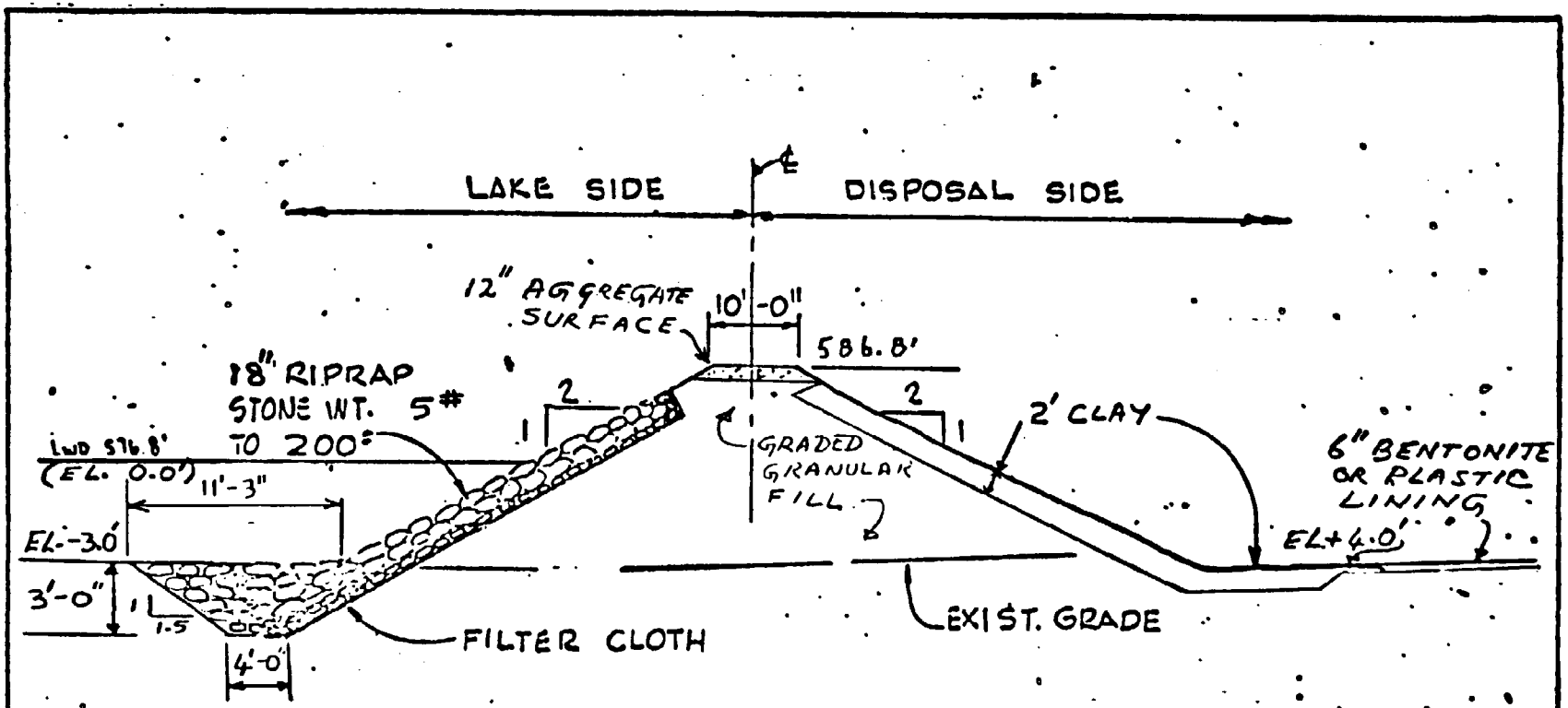
NO SCALE

DIKE SECTION A-A - SITE #4

FRANKFORT DISPOSAL AREA

FIGURE 3


LAKE SIDE
INSIDE
SHEET PILING
586.8'
24'-0"
AGGREGATE SURFACE
2' CLAY
6" BENTONITE OR PLASTIC LINING
W 16" x 89'
10'-0"
LWD 576.8'
(EL. 0.0')
EL.+4.0'
GRADED GRANULAR FILL
45°
ANCHORS 6' O.C.
7'-0"
NEW BOTTOM ELEVATION
EL. -8.3'
EL. -14.5'
EL. -29.0'
SSP
PZ-27
50' LONG.
EL. -41.0'
18" DIA CONCRETE BULBS
EL. -45.0'
4-0.5" DIA. 7 WIRE STRANDS ASTM A 416 GRADE 250, 89' LONG
DIKE SECTION B-B
NO SCALE
FRANKFORT DISPOSAL AREA
SITE #4
MOORING AREA SECTION - SITE Nº 4



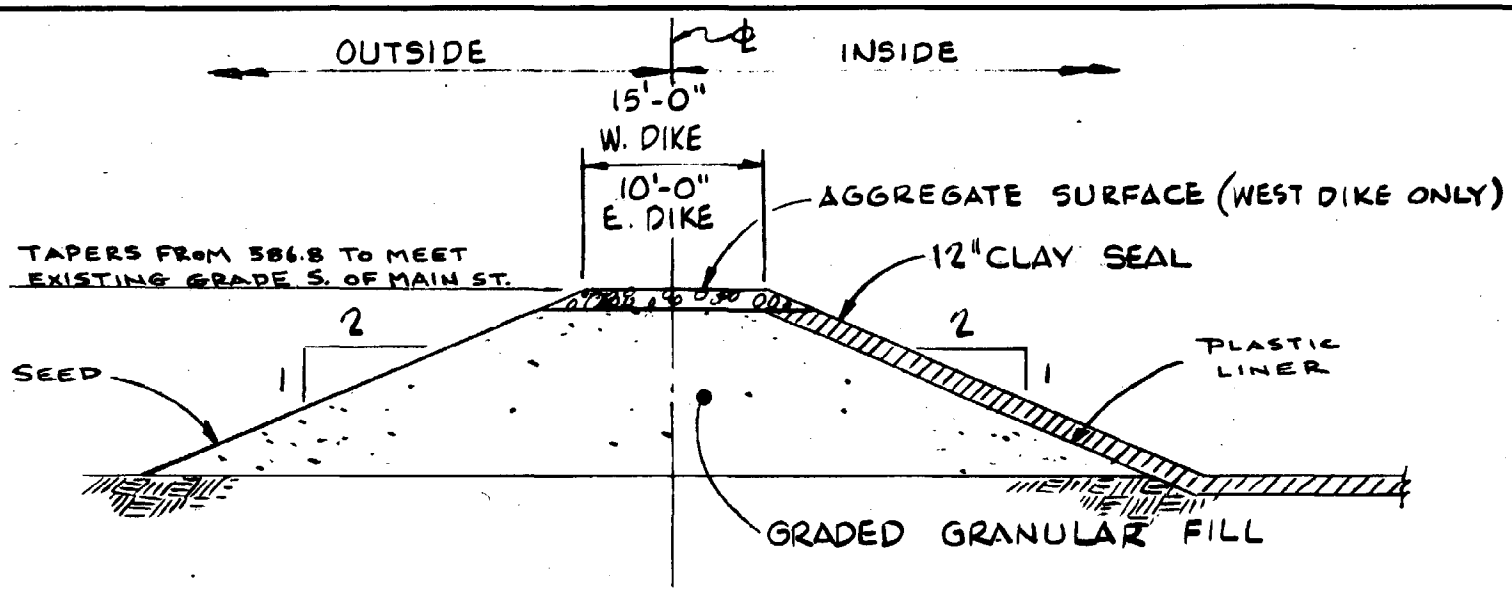
DIKE SECTION C-C

NO SCALE

FRANKFORT DISPOSAL AREA
SITE #4

DIKE SECTION - SITE Nº 4

FIGURE 5



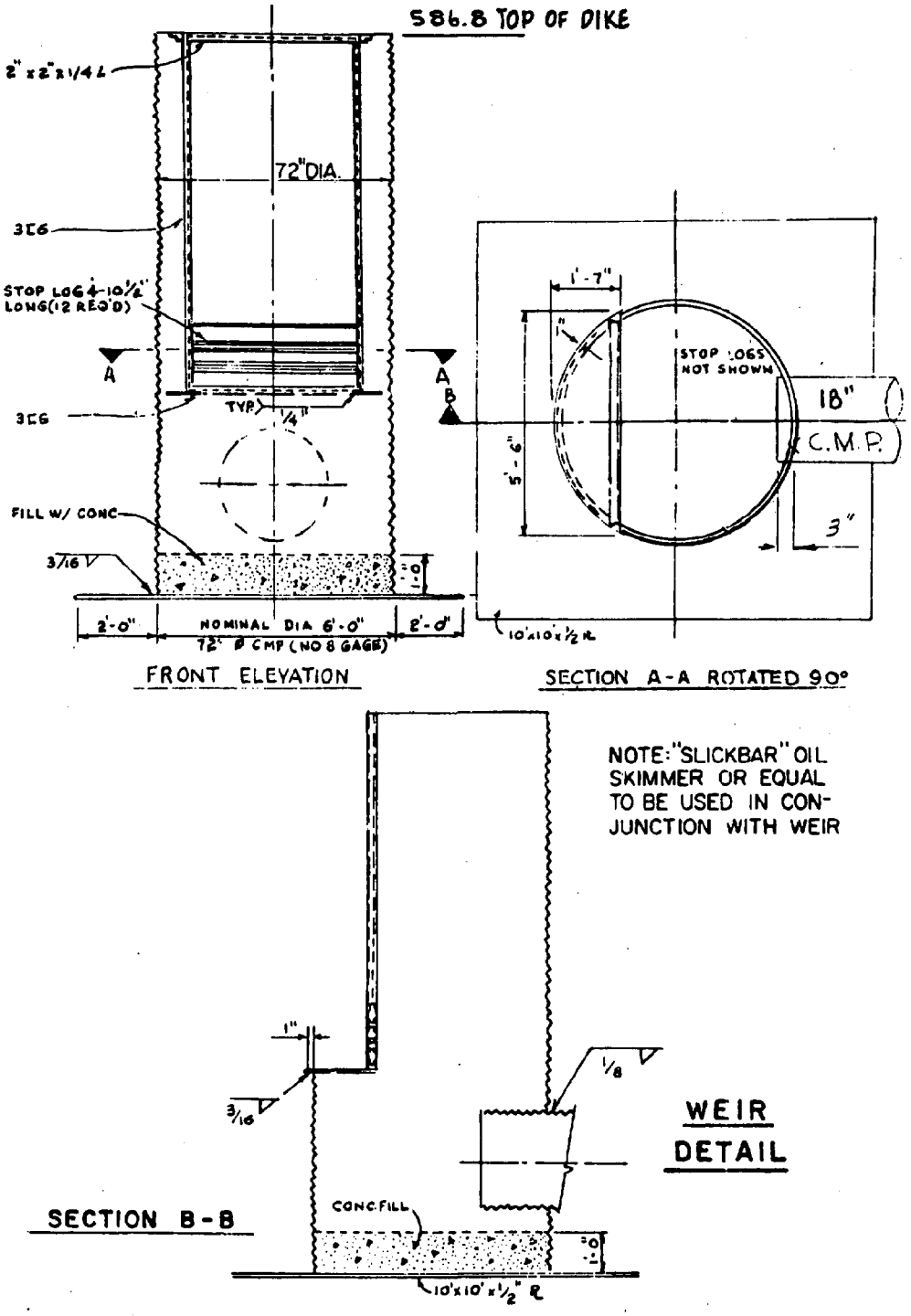
EAST AND WEST DIKE SECTION

NO SCALE

FRANKFORT DISPOSAL AREA
SITE #4

DIKE SECTION – SITE Nº 4

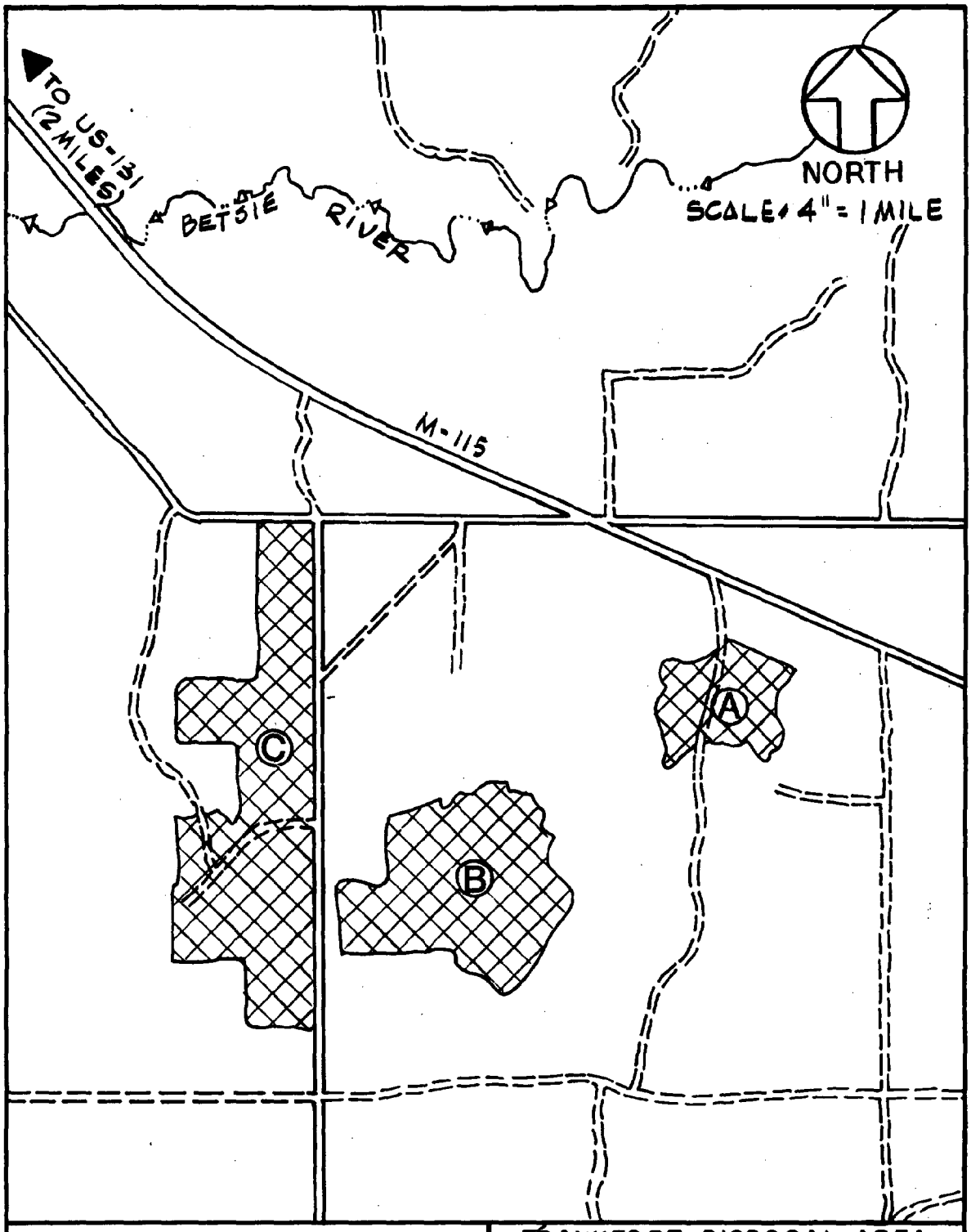
FIGURE 6



FRANKFORT DISPOSAL AREA
SITE #4

OUTLET STRUCTURE
SITE Nº 4

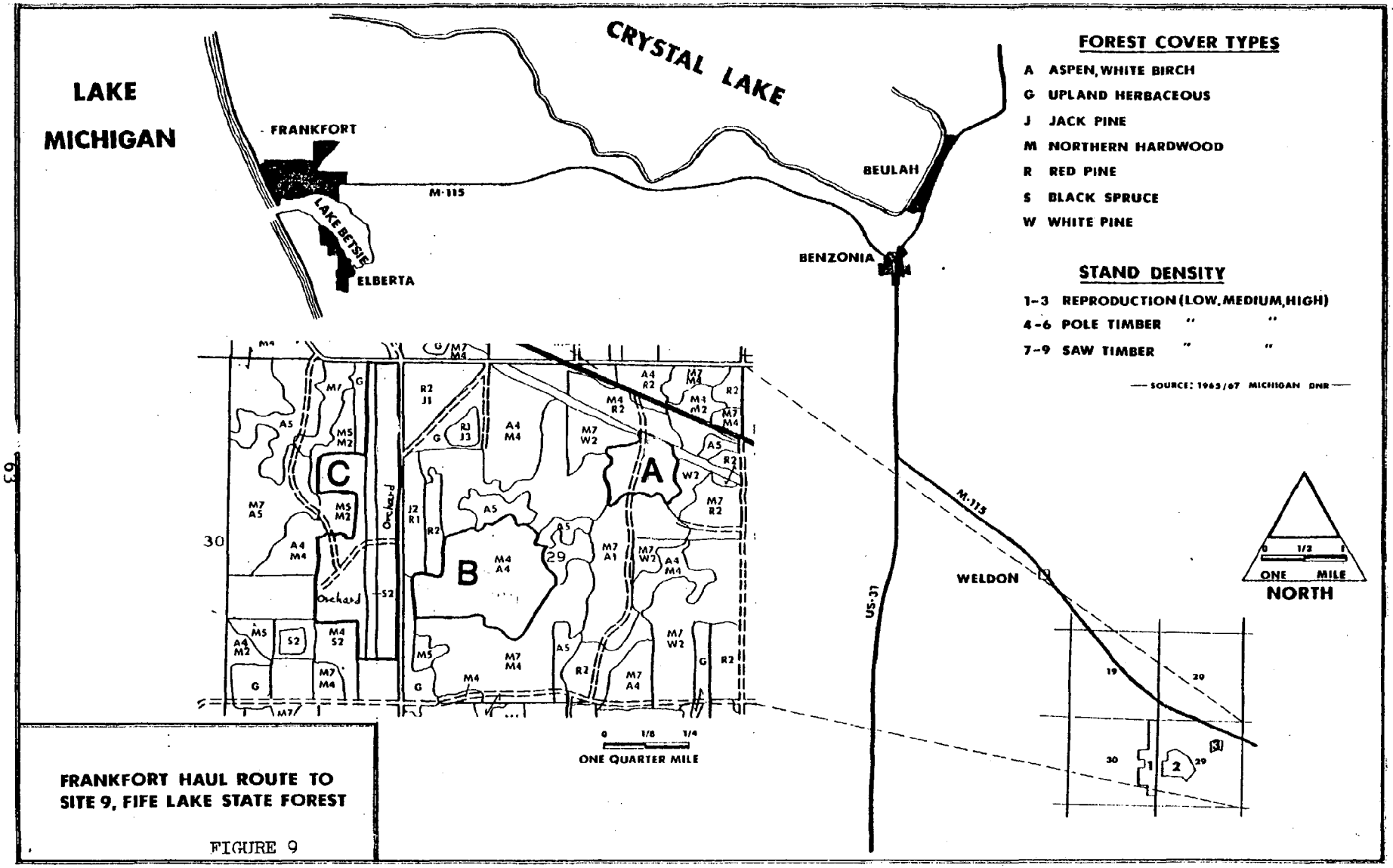
FIGURE 7



FIFE LAKE STATE FOREST
SITE PLAN

FRANKFORT DISPOSAL AREA
SITE #9

FIGURE 8



FRANKFORT HAUL ROUTE TO SITE 9, FIFE LAKE STATE FOREST

FIGURE 9

APPENDIX A

WATER AND SEDIMENT QUALITY DATA

Michigan Water Resources Commission
Betsie River Quality Survey, 1968

US EPA National Eutrophication Survey
Betsie Lake Quality Survey

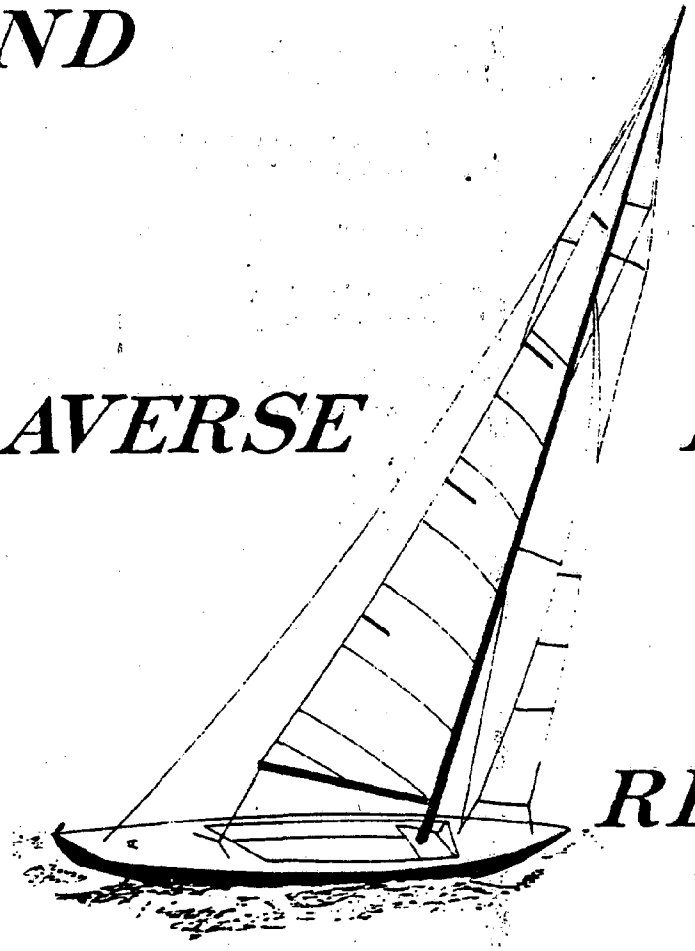
US EPA Bottom Sediment Surveys, 1972,1975

Corps Of Engineers
Inner Harbor Borings

US EPA Guidelines For The Pollutional Classification
Of Great Lakes Harbor Sediments

WATER QUALITY OF SELECTED LAKES AND STREAMS IN THE

GRAND TRAVERSE BAY REGION



Michigan Water Resources Commission
Bureau of Water Management
Department of Natural Resources
State of Michigan

March 1970
A-2

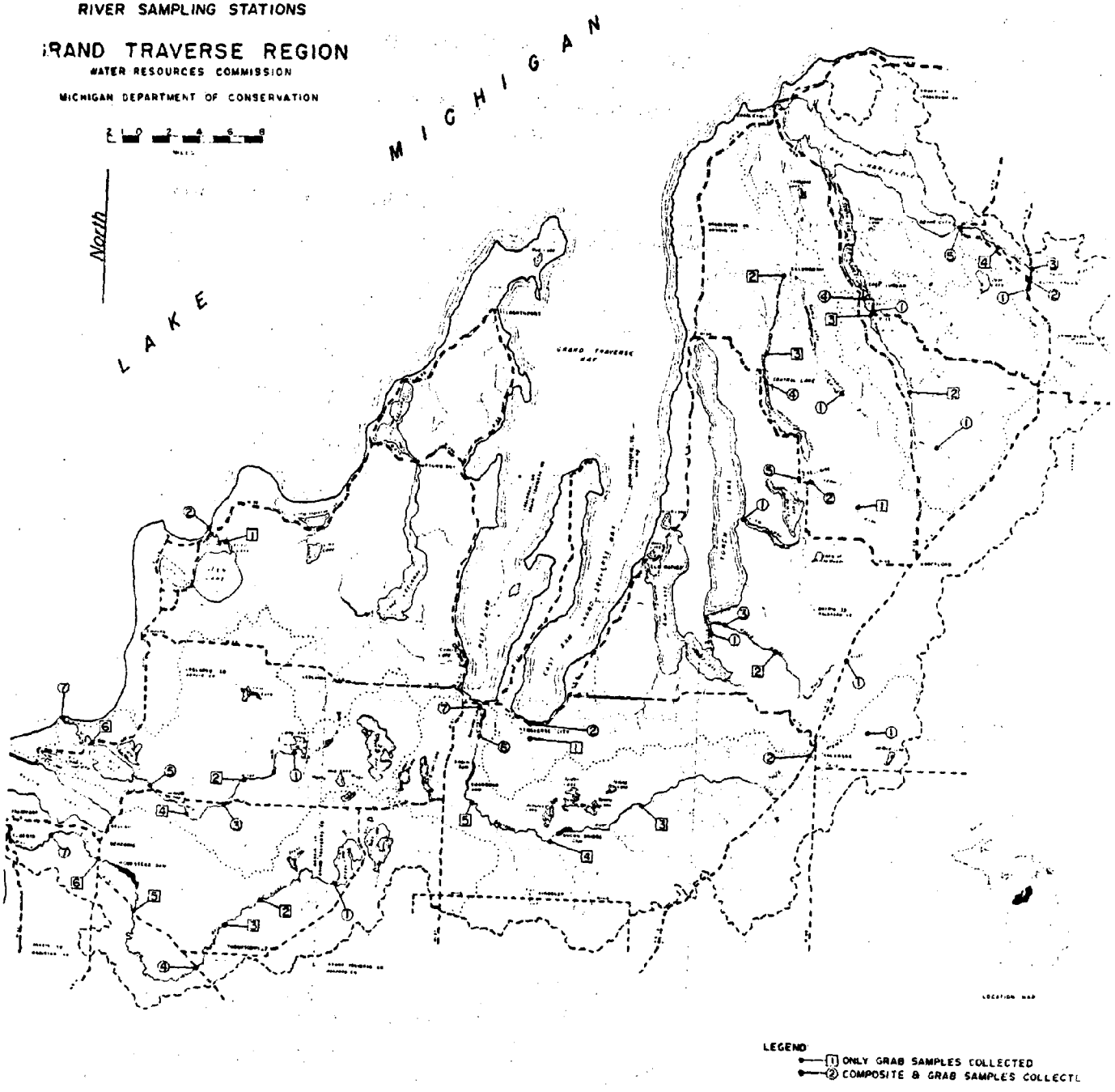
FIGURE 1

RIVER SAMPLING STATIONS

;RAND TRAVERSE REGION

WATER RESOURCES COMMISSION

MICHIGAN DEPARTMENT OF CONSERVATION



RIVER SAMPLING DATA

GRAB SAMPLES

GRAND TRAVERSE REGION, MICHIGAN

JULY, 1968

Station Number	Surface Water	County	Station Location	Date	Time	Weather	Temp. °C	D.O. 100%	D.O. Actual	D.O. % Sat	Total Coliform counts/100 ml.	Fecal Coliform counts/100 ml.
1	Betsie River	G. Traverse	Bezzie River Rd.	7/22	1349	---	23°	8.7	9.0	103%	---	---
				7/22	1550	Clear	26	8.2	9.2	112%	<100	<100
				7/22	2140	---	22	8.8	8.4	95%	---	---
				7/22	2200	---	22	8.8	8.6	97%	---	---
				7/23	0215	---	22	8.8	8.6	97%	---	---
				7/23	0615	---	21	9.0	8.0	88%	---	---
				7/23	0700	Clear	20	9.2	8.2	89%	500	100
				7/23	1045	---	21	9.0	8.8	97%	---	---
2	Betsie River	Benzie	Wallin Rd.	7/22	1318	---	24	8.5	9.0	105%	---	---
				7/22	1630	Clear	26	8.2	9.6	117%	400	400
				7/22	2208	---	20	9.2	7.0	76%	---	---
				7/22	2230	---	23	8.7	6.8	78%	---	---
				7/23	0240	---	21	9.0	6.4	71%	---	---
				7/23	0640	---	20	9.2	6.0	65%	---	---
				7/23	0720	Clear	18	9.5	6.2	65%	8,700	2,100
				7/23	1105	---	24	9.2	8.4	91%	---	---
3	Betsie River	Benzie	Thompsonville Rd.	7/22	1325	---	22°	8.8	9.0	102%	---	---
				7/22	1640	Clear	24	8.5	8.8	103%	300	300
				7/22	2220	---	21	9.0	7.2	80%	---	---
				7/22	2245	---	22	8.8	7.2	81%	---	---
				7/23	0255	---	20	9.2	7.2	78%	---	---
				7/23	0645	---	18	9.5	7.2	75%	---	---
				7/23	0730	Clear	15	10.2	7.4	72%	4,100	<100
				7/23	1115	---	21	9.0	8.7	96%	---	---
4	Betsie River	Manistee	M-115, S. W. of Thompsonville	7/22	1338	---	21°	9.0	9.6	106%	---	---
				7/22	1705	Clear	22	8.8	9.8	111%	200	200
				7/22	2235	---	20	9.2	7.0	76%	---	---
				7/22	2300	---	20	9.2	6.8	73%	---	---
				7/23	0310	---	19	9.4	6.6	70%	---	---
				7/23	0700	---	18	9.5	6.8	71%	---	---
				7/23	0740	Clear	17	9.7	6.8	71%	1,600	400
				7/23	1130	---	20	9.2	8.9	96%	---	---
5	Betsie River	Benzie	M-115, 3 miles E. of M-115 & U. S. 31 Junction	7/22	1348	---	20°	9.2	8.8	95%	---	---
				7/22	1720	Clear	21	9.0	9.2	102%	300	100
				7/22	2245	---	20	9.2	8.2	89%	---	---
				7/22	2315	---	20	9.2	8.2	89%	---	---
				7/23	0320	---	18	9.5	7.8	82%	---	---
				7/23	0705	---	17	9.7	7.8	80%	---	---
				7/23	0745	Clear	17	9.7	7.8	80%	2,500	100
				7/23	1140	---	20	9.2	8.4	91%	---	---
6	Betsie River	Benzie	U.S. 31 S. of Benzonia	7/22	1400	---	22°	8.8	9.0	102%	---	---
				7/22	1731	Clear	21	9.0	8.6	95%	100	<100
				7/22	2255	---	20	9.2	7.8	84%	---	---
				7/22	2325	---	20	9.2	7.8	84%	---	---
				7/23	0335	---	20	9.2	8.2	89%	---	---
				7/23	0715	---	20	9.2	7.8	84%	---	---
				7/23	0800	Clear	19	9.4	8.1	86%	900	<100
				7/23	1150	---	20	9.2	8.6	93%	---	---
7	Betsie River	Benzie	River Road S. W. of Benzonia	7/22	1408	---	23°	8.7	9.4	108%	---	---
				7/22	1800	Clear	23	8.7	10.4	119%	3,800	600
				7/22	2310	---	20	9.2	7.8	84%	---	---
				7/22	2335	---	21	9.0	7.8	86%	---	---
				7/23	0350	---	19	9.4	7.2	76%	---	---
				7/23	0730	---	18	9.5	7.2	75%	---	---
				7/23	0815	Clear	19	9.4	---	---	2,300	310
				7/23	1205	---	20	9.2	8.6	93%	---	---
8	Betsie River	Benzie	M-22 Between Elberta & Frankfort	7/22	1415	---	22°	8.8	8.8	100%	---	---
				7/22	1815	Clear	24	8.5	9.8	115%	200	40
				7/22	2320	---	21	9.0	8.0	88%	---	---
				7/22	2350	---	22	8.8	7.6	86%	---	---
				7/23	0400	---	21	9.0	7.4	82%	---	---
				7/23	0735	---	18	9.5	7.0	73%	---	---
				7/23	0825	Clear	20	9.2	6.4	69%	9,200	660
				7/23	1215	---	21	9.0	7.9	87%	---	---
9	Betsie River	Benzie	Off Pier At Coast Guard Station In Frankfort	7/22	1435	---	22°	8.8	7.8	88%	---	---
				7/22	1840	Clear	22	8.8	8.0	90%	200	<100
				7/22	2335	---	21	9.0	7.6	84%	---	---
				7/23	0005	---	22	8.8	8.2	93%	---	---
				7/23	0410	---	21	9.0	8.2	91%	---	---
				7/23	0745	---	20	9.2	7.8	84%	---	---
				7/23	0835	Clear	20	9.2	7.8	84%	100	20
				7/23	1220	---	21	9.0	8.1	90%	---	---

RIVER SAMPLING DATA

COMPOSITE SAMPLES

GRAND TRAVERSE REGION, MICHIGAN

JULY, 1968

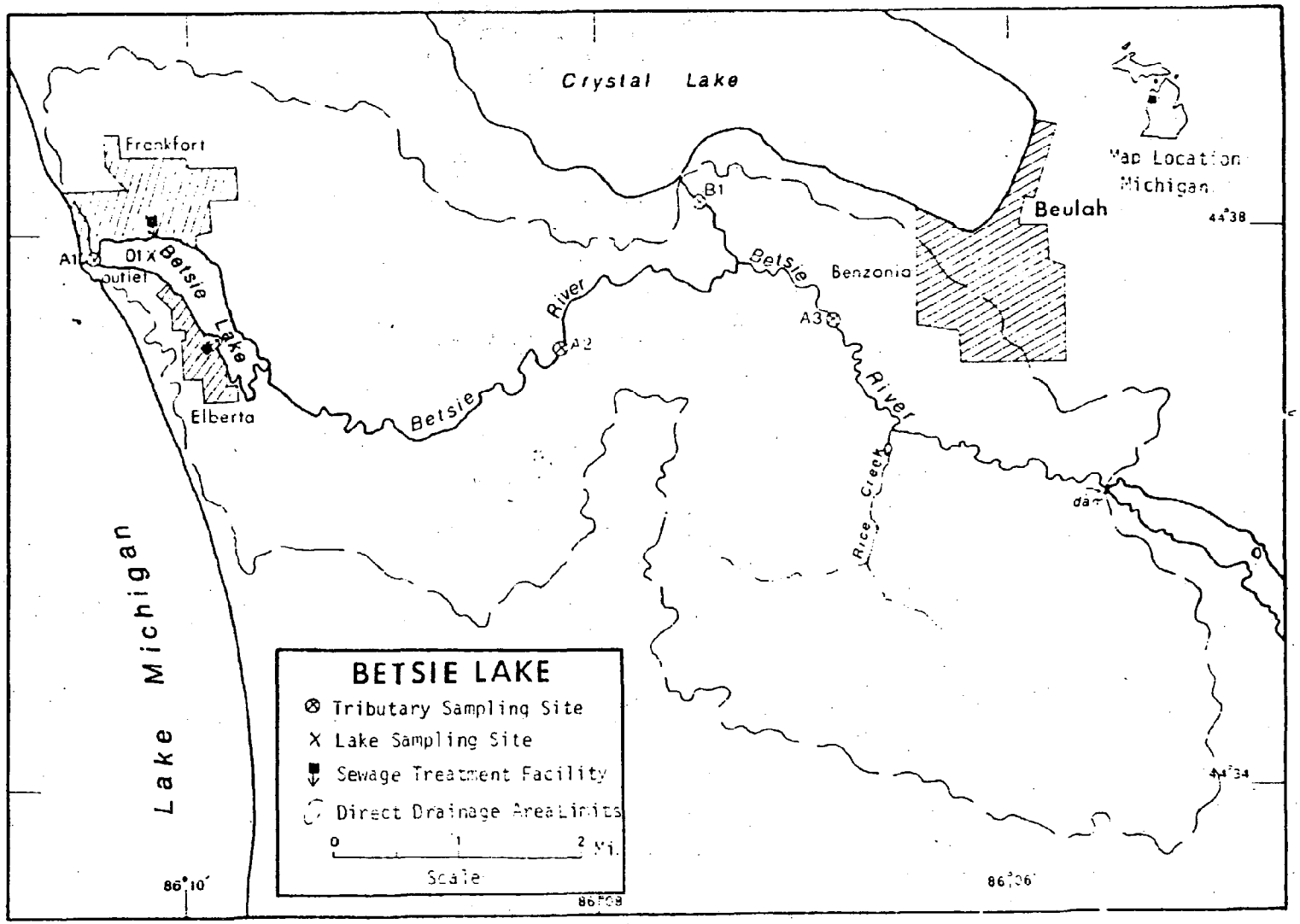
Station Number	Surface Water	Station Location	5-day BOD	Total Solids	Total Dissolved Solids	Suspended Solids	Nitrate-N	Ammonia-N	Soluble Ortho Phosphate-P	Total Phosphate-P	Chlorides	Iron	Calcium	Magnesium	Sodium	Potassium	Sulfate	pH	Hardness	Alkalinity	Carbonate
1	Betsie River	Betsie River Road	0.4	172	166	6	0.00	0.1	0.00	0.04	0	0.0	38	9	3.0	0.5	25	8.1	130	135	0
2	Betsie River	Wallin Road	0.7																		
3	Betsie River	Thompsonville Road	0.7																		
4	Betsie River	M-115, S. W. of Thompsonville	0.6	181	175	6	0.20	0.0	0.00	0.03	0	0.1	44	9	3.2	0.5	21	8.0	145	150	0
5	Betsie River	M-115, 3 miles E. of M-115 & U.S. 31 Jct.	0.6																		
6	Betsie River	U. S. 31 S. of Benzonia	1.0																		
7	Betsie River	River Road S. W. of Benzonia	0.6	200	186	14	0.20	0.0	0.00	0.05	0	0.2	44	10	3.9	0.6	30	8.0	150	150	0
8	Betsie River	M-22 Between Elberta & Frankfort	0.8																		
9	Betsie River	Off Pier at Coast Guard Station in Frankfort	1.1	198	180	18	0.10	0.0	0.00	0.05	2	0.3	40	11	4.4	0.6	29	8.0	145	140	0
1	Platte River	Sanford Lake Road, by Lake Ann	0.7	145	140	5	0.00	0.0	0.00	0.02	0	0.0	38	9	1.8	0.5	20	8.0	130	130	0
2	Platte River	Co. Rd. 669 above Fish Hatchery N. of Honor	0.6																		
	Platte River	U.S. 31, E. of Honor	0.8	189	180	9	0.25	0.0	0.00	0.02	0	0.0	46	9	2.5	0.5	15	8.0	150	155	0
	Platte River	N. Pioneer Rd., S. E. of Honor	0.6																		
5	Platte River	Indian Hill Rd., N. W. of Honor	0.4	194	186	8	0.40	0.0	0.00	0.03	0	0.0	48	9	3.2	0.5	15	8.0	155	165	0
6	Platte River	M-22 in Edge Water	0.8																		
7	Platte River	Lake Twp. Park, west of Edgewater, (mouth of river)	1.0	170	166	4	0.10	0.0	0.00	0.02	0	0.0	40	10	3.2	0.5	31	8.0	140	150	0
1	Boardman River	Co. Rd 612, N. E. of Kalkaska	0.4 0.1* 1.2* 0.8* 0.6*	175	170	5	0.7	0.0	---	0.00	0	---	---	---	---	---	13	8.1	150	---	0
2	Boardman River	U.S. 131, W. of Kalkaska	0.4 0.6* 0.6* 0.6* 0.6*	170	167	3	0.4	0.1	---	0.02	0	---	---	---	---	---	12	7.9	145	---	0
3	Boardman River	Supply Rd. S. W. of Kalkaska	0.4 0.6* 0.6* 0.8* 0.4*																		
4	Boardman River	Garfield Road	1.0 0.8* 1.0* 1.0* 1.0*																		
5	Boardman River	Beltner Road	0.6 0.4* 0.8* 0.8* 2.4*																		
6	Boardman River	S. Airport Road	0.4 0.8* 0.8* 0.8* 0.2*	190	184	6	0.35	0.1	---	0.0	0	---	---	---	---	---	15	8.0	150	---	0

NOTE: * BOD analyses made on grab samples collected from 0605 to 2020 on 7-18-68.
All constituents except pH are expressed as mg./l.

TABLE 3-A

AVERAGE TEMPERATURES AND DISSOLVED OXYGEN CONCENTRATIONS AT THE RIVER SAMPLING STATIONS

River	Station Number	Average Temp. °C	Average D.O. (mg./l.)	Average % Saturation
Betsie	1	22.1	8.6	97
	2	21.5	7.4	83
	3	20.4	7.8	86
	4	19.6	7.8	84
	5	19.1	8.3	89
	6	20.3	8.2	90
	7	20.4	8.3	91
	8	21.1	7.9	88
	9	21.1	7.9	88
Platte	1	20.9	7.9	88
	2	19.3	9.3	91
	3	16.9	8.7	89
	4	16.9	8.8	92
	5	17.4	9.2	95
	6	20.5	8.4	93
	7	22.2	8.2	93
Boardman Run #1	1	16.6	9.0	91
	2	21.4	6.3	70
	3	17.0	8.7	89
	4	19.0	9.4	100
	5	19.0	8.5	90
	6	22.0	7.5	86
	7	23.6	8.6	98
Boardman Run #2	1	14.5	9.3	90
	2	19.3	8.4	89
	3	15.9	9.3	93
	4	17.5	9.6	100
	5	18.0	9.0	92
	6	19.8	9.2	99
	7	21.5	8.9	100
Mitchell Creek	1	18.0	7.3	76
	2	17.5	7.8	82
Torch	1	---	9.6	---


Crystal Lake
Frankfort
A1
01
outlet
Betsie Lake
Elberta
Betsie River
A2
B1
Betsie River
Benzonia
A3
Beulah
Map Location
Michigan
Rice Creek
dam
Lake Michigan
44°38
44°34
86°10'
86°08
86°06'
BETSIE LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Direct Drainage Area Limits
0
1
2 Mi.
Scale

Physical and chemical characteristics:

FALL VALUES

(11/12/72)

Parameter	Minimum	Mean	Median	Maximum
Temperature (Cent.)	6.2	6.2	6.2	6.2
Dissolved oxygen (mg/l)	9.8	9.9	9.9	10.0
Conductivity (µmhos)	310	313	310	320
pH (units)	7.6	7.6	7.6	7.6
Alkalinity (mg/l)	127	128	127	129
Total P (mg/l)	0.022	0.025	0.022	0.031
Dissolved P (mg/)	0.007	0.008	0.007	0.011
NO_2 + NO_3 (mg/l)	0.240	0.240	0.240	0.240
Ammonia (mg/l)	0.030	0.033	0.030	0.040

ALL VALUES

Secchi disc (inches)	24	38	37	54

STORET RETRIEVAL DATE 75/02/04

261001
47 37 48.0 086 14 00.0
BETSIE LAKE
26 MICHIGAN

11EPALES 2111202
J 0015 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/06/17	15	14 0000	17.4	9.0	37	280	8.07	150	0.100	0.040	0.017	0.006
	15	14 0012	15.1	7.6		270	8.03	152	0.110	0.060	0.016	0.006
72/09/15	11	37 0000			24	303	7.95	145	0.130	0.030	0.036	0.014
	11	37 0004	17.4	9.0		305	7.95	145	0.140	0.040	0.046	0.014
	11	37 0015	17.4	8.8		300	7.96	144	0.130	0.030	0.031	0.013
72/11/12	15	30 0000			54	320	7.60	127	0.240	0.040	0.031	0.011
	15	30 0004	6.2	9.8		310	7.60	127	0.240	0.030	0.022	0.007
	15	30 0018	6.2	10.0		310	7.60	129	0.240	0.030	0.022	0.007

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/06/17	15	14 0000	1.30
72/09/15	11	37 0000	11.30
72/11/12	15	30 0000	1.10

J VALUE KNOWN TO BE [illegible]

STORET RETRIEVAL DATE 75/02/04

2610A1 LS2610A1
44 38 00.0 086 15 30.0
BETSIE LAKE
26163 15 FRANKFORT
U/BETSIE LAKE
2ND ST IN FRANKFORT
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/10/29	10 00		0.108	1.400	0.050	0.005K	0.031
72/11/27	16 40		0.280	1.650	0.046	0.014	0.035
72/12/29	10 10		0.290	0.390	0.042	0.011	0.025
73/02/03	08 11		0.270	0.610	0.026	0.011	0.022
73/03/03	07 50		0.330	0.260	0.039	0.008	0.020
73/04/08			0.210	0.370	0.050	0.009	0.025
73/04/29	12 30		0.132	1.470	0.058	0.010	0.040
73/05/13	15 25		0.154	0.420	0.079	0.011	0.045
73/06/14	09 00		0.029	0.660	0.009	0.005K	0.040
73/06/26	21 51		0.023	0.950	0.027	0.014	0.040
73/07/14	07 45		0.078	0.630	0.037	0.006	0.040
73/08/12	07 30		0.010K	0.460	0.007	0.005K	0.040
73/09/08	16 30		0.017	0.540	0.034	0.007	0.050
73/10/03	18 30		0.132	0.690	0.027	0.006	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/04

261UA2 LS261UA2
44 37 00.0 086 10 00.0
BETSIE RIVER
26 1S FRANKFORT
I/BETSIE LAKE
.25 MI BELO LEWIS BRDG BELOBENZONIA STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/10/29	10 25		0.870	0.500	0.120	0.005K	0.016
72/11/27	16 54		0.280	0.420	0.015	0.005K	0.011
72/12/29	10 25		0.273	1.760	0.260	0.005K	0.017
73/02/03	08 25		0.252	0.500	0.049	0.006	0.010
73/03/03	08 10		0.300	0.250	0.036	0.005K	0.015
73/04/08	12 00		0.210	0.490	0.056	0.007	0.020
73/04/29	12 34		0.126	2.100	0.065	0.007	0.020
73/05/13	15 00		0.130	0.480	0.022	0.005K	0.025
73/06/14	09 12		0.094	0.785	0.035	0.005K	0.035
73/06/26	22 05		0.120	0.580	0.020	0.010	0.035
73/07/14	08 00		0.120	0.520	0.065	0.005K	0.025
73/08/12	07 45		0.126	0.370	0.020	0.005K	0.025
73/09/08	16 25		0.200	0.660	0.052	0.005K	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/04

261DA3 LS261DA3
44 37 00.0 086 07 30.0
BETSIE RIVER
26 15 FRANKFORT
F/BETSIE LAKE
BRDG 1.25 W ST HWY 115 ABOVBENZONIA STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/27	17 05		0.280	0.390	0.009	0.005K	0.012
72/12/29	10 50		0.280	0.390	0.040	0.005K	0.005K
73/02/03	08 35		0.252	0.540	0.033	0.005K	0.010
73/03/03	08 20		0.300	0.240	0.034	0.005K	0.015
73/04/08	12 15		0.210	0.420	0.056	0.007	0.015
73/04/29	12 45		0.138	0.980	0.052	0.007	0.020
73/05/13	15 05		0.132	0.400	0.042	0.006	0.025
73/05/14	09 20		0.110	0.790	0.042	0.005K	0.032
73/06/26	22 16		0.147	1.080	0.033	0.011	0.030
73/07/14	08 10		0.126	0.450	0.052	0.005K	0.025
73/08/12	08 00		0.132	0.520	0.027	0.030	0.060
73/09/08	16 15		0.132	0.540	0.046	0.005K	0.030
73/10/03	18 55		0.140	0.820	0.027	0.005K	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/04

261081 LS261081
44 39 00.0 086 08 30.0
UNNAMED OUTLET CRYSTAL LAKE
26 15 FRANKFORT
T/BETSIE LAKE
ST HWY 115 BRDG 1.75 MI W BENZONIA
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/27	16 30		0.048	0.390	0.014	0.005K	0.008
72/12/29	09 50		0.070	1.540	0.025	0.005K	0.005K
73/02/03	08 00		0.075	0.520	0.020	0.005K	0.005K
73/03/03	07 45		0.069	0.120	0.017	0.005K	0.005K
73/04/08	11 15		0.062	0.140	0.018	0.005K	0.005K
73/04/29	12 35		0.048	0.850	0.028	0.005K	
73/05/13	15 35		0.054	1.050	0.062	0.005K	0.010
73/06/14	08 50		0.013	0.630	0.037	0.005K	0.010
73/06/26	21 38		0.017	0.540	0.027	0.006	0.006
73/07/14	07 30		0.016	0.260	0.038	0.005K	0.005K
73/08/12	07 20		0.010K	0.420	0.016	0.005K	0.010
73/09/08	16 50		0.014	1.200	0.077	0.007	0.010
73/10/03	18 00		0.020	1.150	0.020	0.005K	0.005K

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/04

261050 PR261050 P0005+5
44 37 00.0 086 10 00.0
ELBERTA
26163 15 FRANKFORT
U/BETSIE LAKE
BETSIE LAKE
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/01/29	08	10	1.500	15.000	1.370	2.100	4.200	0.147	0.132
73/02/28	08	00							
CP(T)-			1.000	24.000	5.200	2.800	5.100	0.129	0.139
73/02/28	17	00							
73/04/05	08	00							
CP(T)-			1.500	22.000	4.100	3.200	6.800	0.140	0.139
73/04/05	13	00							
73/05/14	08	00							
CP(T)-			0.990	14.400	0.150	2.300	5.700	0.132	0.139
73/05/14	17	00							
73/06/04	08	00							
CP(T)-			1.570	20.000	3.760	3.000	5.700	0.155	0.141
73/06/04	17	00							
73/07/12	07	00							
CP(T)-			1.540	16.800	1.760	2.100	3.450	0.165	0.160
73/07/12	17	00							
73/09/19	08	00							
CP(T)-			5.400	16.300	3.320	2.400	6.500	0.110	0.125
73/09/19	17	00							
73/10/16	08	00							
CP(T)-			0.0108	21.000	8.600	3.300	4.400	0.110	0.155
73/10/18	17	00							
73/11/26	09	00							
CP(T)-			0.660	19.500	2.770	2.970	5.000	0.112	0.116
73/11/26	12	00							
74/03/12	09	00							
CP(T)-			2.000	11.000	0.240	2.000	3.500	0.124	0.130
74/03/12	16	00							
74/04/21	09	00							
CP(T)-			1.450	25.000	3.450	2.200	4.400	0.121	0.123
74/04/21	16	00							
74/05/29	14	30	1.240	22.000	4.000	3.300	6.100	0.207	0.156
74/06/24	15	00	1.800	9.400	0.015	1.450	4.500	0.248	0.236

STORET RETRIEVAL DATE 75/02/04

261051 PR261051 P001750
44 38 00.0 086 10 00.0
FRANKFORT
26 15 FRANKFORT
D/BETSIE LAKE
BETSIE LAKE
LIEPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/01/25	08 00								
CP(T)-			1.500	19.900	2.100	3.100	6.860	0.513	0.420
73/01/25	17 00								
63/02/12	08 00								
CP(T)-			1.700	24.000	3.700	3.100	7.500	0.394	0.464
73/02/12	05 00								
73/03/06	08 00								
CP(T)-			1.500	20.000	1.470	2.900	8.300	0.472	0.406
73/03/06	17 00								
73/04/16	08 30								
CP(T)-			0.980	17.000	1.160	2.600	5.900	0.488	0.474
73/04/16	16 15								
73/05/21	08 00								
CP(T)-			1.000	31.000	2.400	4.300	10.000	0.510	0.460
73/05/21	16 30								
73/06/29	08 30								
CP(T)-			1.000	24.000	6.100	3.400	6.800	0.437	0.474
73/06/29	16 30								
73/07/10	08 00								
CP(T)-			0.018	32.600	3.040	7.500	13.500	0.328	0.368
73/07/10	16 30								
73/08/08	08 30								
CP(T)-			0.130	22.000	3.400	3.620	7.000	0.492	0.431
73/08/08	16 00								
73/09/10	08 15								
CP(T)-			0.110	26.000	4.500	5.100	9.700	0.368	0.438
73/09/10	16 30								
73/10/08	08 30								
CP(T)-			0.250	26.000	4.500	6.400	10.000	0.367	0.336
73/10/08	16 45								
73/11/05	08 15								
CP(T)-			0.130	27.000	7.400	5.100	9.900	0.355	0.351
73/11/05	16 40								
73/12/07	08 20								
CP(T)-			1.250	25.000	3.000	5.800	10.500	0.400	0.377
73/12/07	16 40								

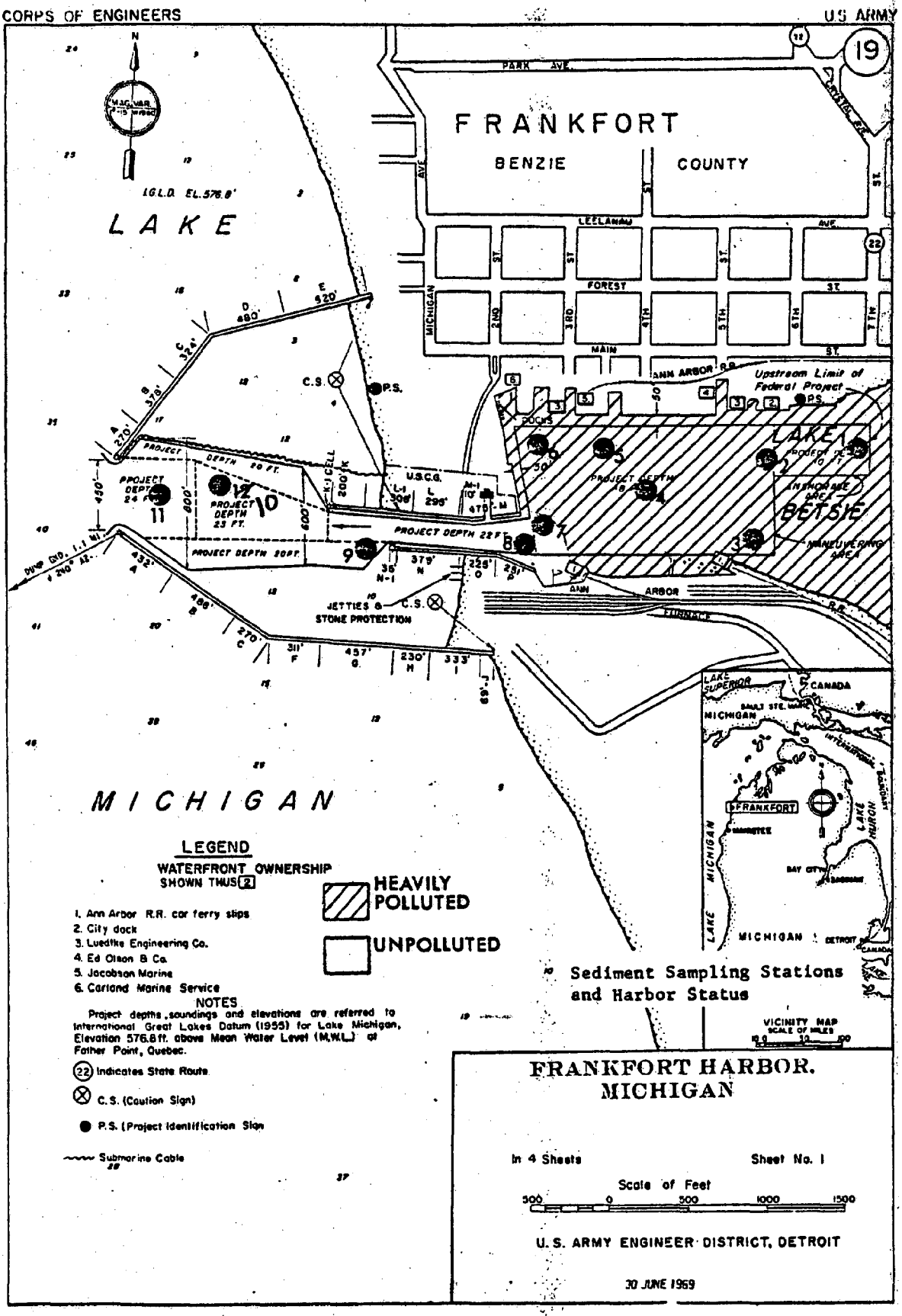
STORET RETRIEVAL DATE 75/02/04

261051 PR261051 P001750
44 38 00.0 086 10 00.0
FRANKFORT
26 15 FRANKFORT
U/BETSIE LAKE
BETSIE LAKE
11EPALES 2141204
* 0000 FEET DEPTH

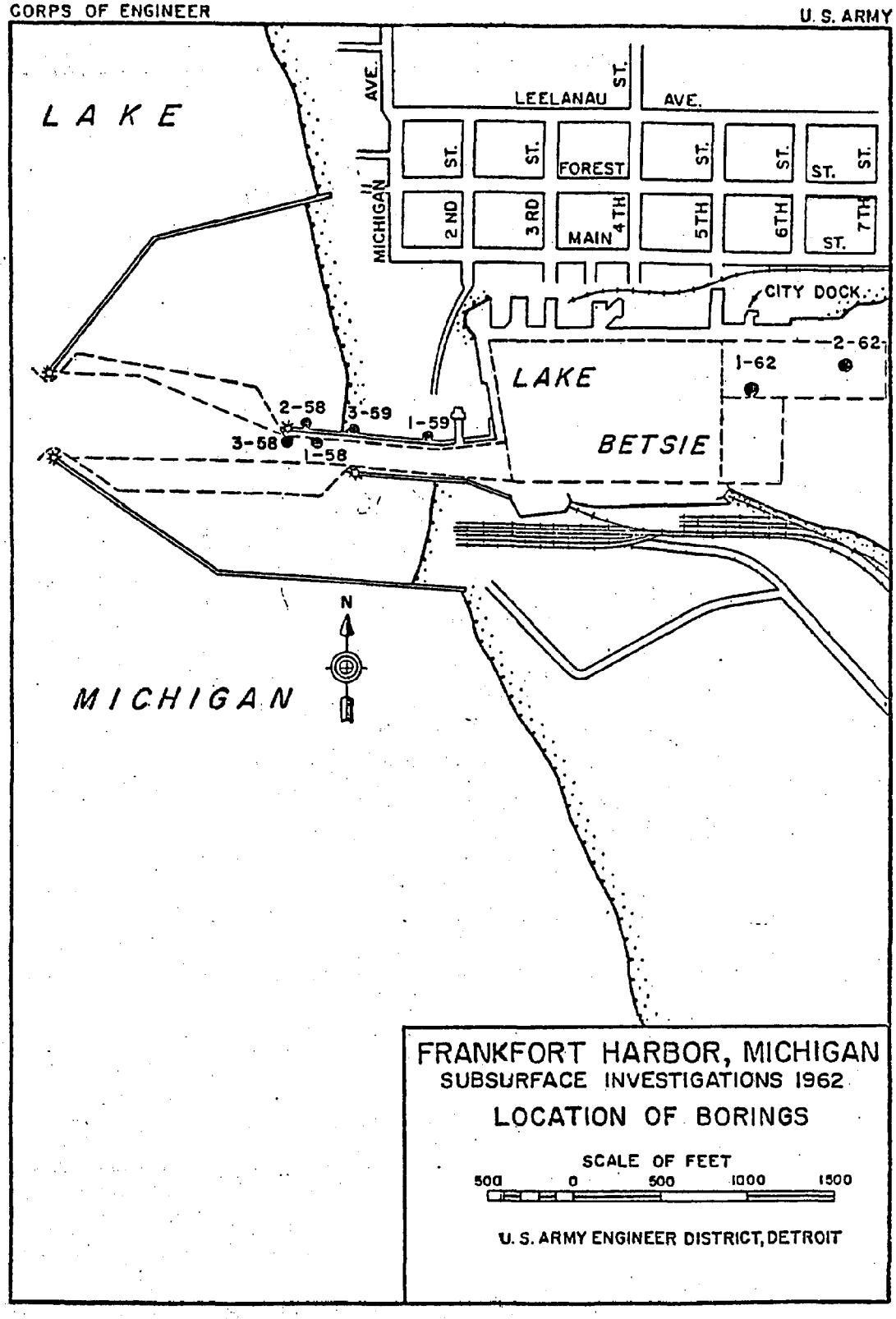
DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW=MGD MONTHLY
74/01/10 CP(T)- 74/01/10	08 30 16 45		0.440	21.000	1.400	5.800	10.500	0.351	0.379

EPA - FRANKFORT HARBOR BOTTOM SEDIMENT DATA
1972 and 1975
(Mg/Kg Dry Weight)

Station Number	Year	Composition	Solids (Percent) Total	Solids (Percent) Tot. Vol	Chem Oxy Demand	Tot. Kjel Nit	Tot. Phos	Oil & Grease	Total Iron	Phenol	Mercury	Lead	Zinc
1	1972	100% org. silt	26.6	21.5	310,000	5,600	680	3,000	17,000	900	-	-	-
2	1975	87% silt	18.1	24.6	420,000	11,000	1,200	2,200	19,000	-	<.1	68	130
3	1975	81% silt	17.6	28.9	400,000	10,000	680	2,100	18,000	-	<.1	22	56
4	1975	48% silt 47% sand	49.1	6.69	100,000	2,500	270	500	290	-	<.1	27	334
5	1972	100% silt	30.8	17.3	240,000	5,500	910	2,100	16,000	4,200	-	-	-
6	1975	72% silt	30.2	16.6	230,000	6,100	800	1,100	15,000	-	<.1	66	93
7	1972	100% sand	83.0	0.2	550	290	45	230	2,600	22	-	-	-
8	1975	51% sand 43% silt	67.6	2.32	32,000	760	180	400	140	-	<.1	<10	18
9	1972	90% sand	79.1	.7	9,900	200	97	290	2,700	4.0	-	-	-
10	1972	95% sand	78.8	.7	5,800	180	56	300	1,600	4.0	-	-	-
11	1972	100% sand	82.4	.4	360	20	37	270	1,600	-	-	-	-

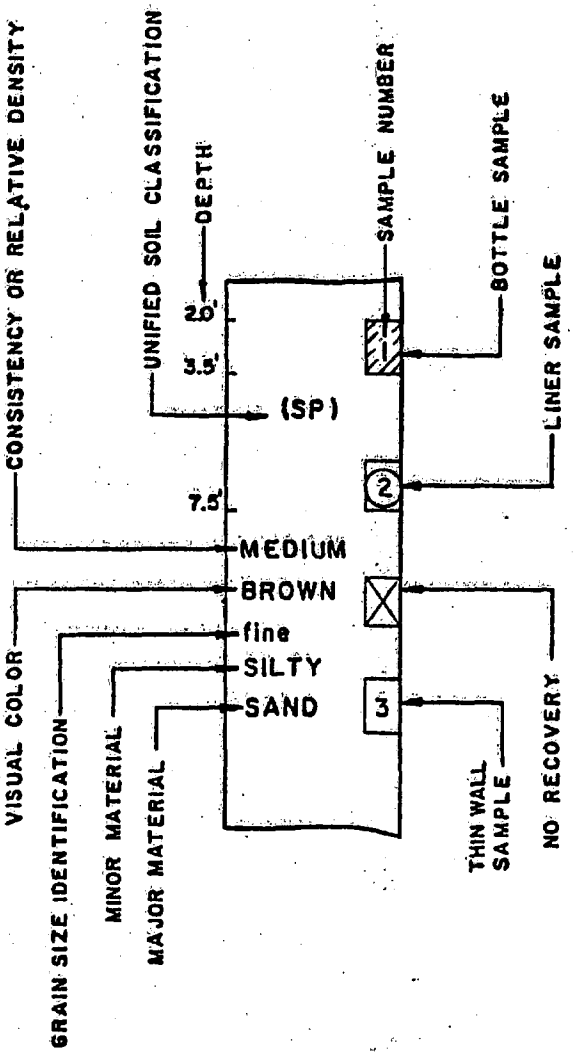

CORPS OF ENGINEERS
U.S. ARMY
19
FRANKFORT
BENZIE
COUNTY
PARK AVE.
LEELANAU AVE.
FOREST ST.
MAIN ST.
MICHIGAN
2ND ST.
3RD ST.
4TH ST.
5TH ST.
6TH ST.
7TH ST.
ANN ARBOR R.R.
Upstream Limit of Federal Project
LAKE
BETSIE
MANEUVERING AREA
INSHORE AREA
DOCKS
PROJECT DEPTH 20 FT.
PROJECT DEPTH 22 FT.
PROJECT DEPTH 23 FT.
PROJECT DEPTH 24 FT.
U.S.C.G.
JETTIES & STONE PROTECTION
C.S.
P.S.
I.G.L.D. EL. 576.8'
LAKE
MICHIGAN
LEGEND
WATERFRONT OWNERSHIP SHOWN THUS 2
1. Ann Arbor R.R. car ferry slips
2. City dock
3. Luedtke Engineering Co.
4. Ed Olson & Co.
5. Jacobson Marine
6. Carland Marine Service
HEAVILY POLLUTED
UNPOLLUTED
NOTES
Project depths, soundings and elevations are referred to International Great Lakes Datum (1955) for Lake Michigan, Elevation 576.8 ft. above Mean Water Level (M.W.L.) at Father Point, Quebec.
22 Indicates State Route
C.S. (Caution Sign)
P.S. (Project Identification Sign
Submarine Cable
Sediment Sampling Stations and Harbor Status
VICINITY MAP
SCALE OF MILES
FRANKFORT HARBOR, MICHIGAN
In 4 Sheets
Sheet No. 1
Scale of Feet
500 0 500 1000 1500
U.S. ARMY ENGINEER DISTRICT, DETROIT
30 JUNE 1969

CORPS OF ENGINEER U. S. ARMY



CORPS OF ENGINEERS U. S. ARMY

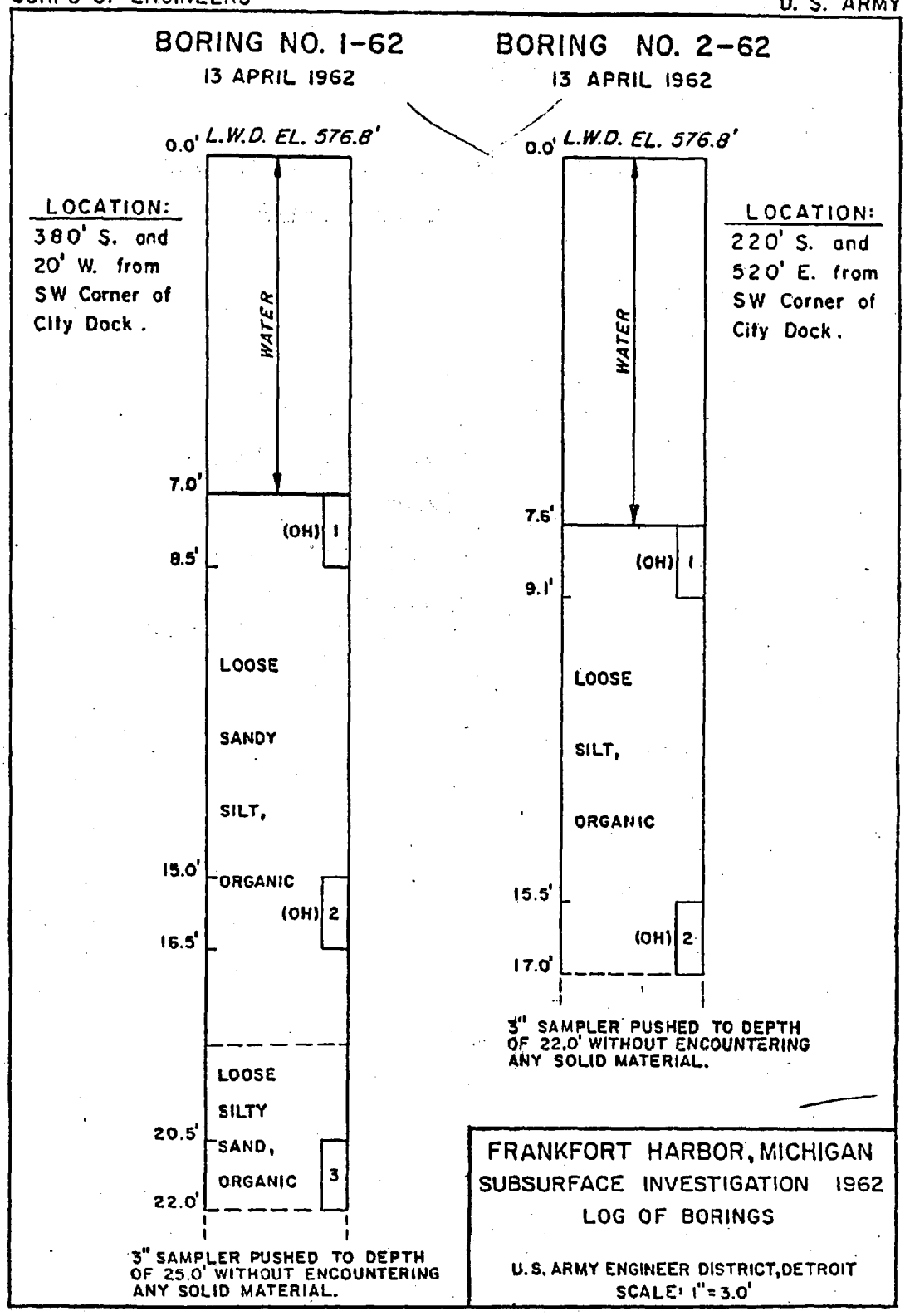
BORING LOG LEGEND



FRANKFORT HARBOR, MICHIGAN
SUBSURFACE INVESTIGATION
BORING LOG LEGEND

U. S. ARMY ENGINEER DISTRICT, DETROIT

CORPS OF ENGINEERS U. S. ARMY



GUIDELINES FOR THE POLLUTIONAL CLASSIFICATION OF GREAT LAKES HARBOR SEDIMENTS

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION V

CHICAGO, ILLINOIS

April, 1977

Guidelines for the evaluation of Great Lakes harbor sediments, based on bulk sediment analysis, have been developed by Region V of the U.S. Environmental Protection Agency. These guidelines, developed under the pressure of the need to make immediate decisions regarding the disposal of dredged material, have not been adequately related to the impact of the sediments on the lakes and are considered interim guidelines until more scientifically sound guidelines are developed.

The guidelines are based on the following facts and assumptions:

1. Sediments that have been severely altered by the activities of man are most likely to have adverse environmental impacts.

2. The variability of the sampling and analytical techniques is such that the assessment of any sample must be based on all factors and not on any single parameter with the exception of mercury and polychlorinated biphenyls (PCB's).

3. Due to the documented bioaccumulation of mercury and PBC's, rigid limitations are used which override all other considerations.

Sediments are classified as heavily polluted, moderately polluted, or nonpolluted by evaluating each parameter measured against the scales shown below. The overall classification of the sample is based on the most predominant classification of the individual parameters. Additional factors such as elutriate test results, source of contamination particle size distribution, benthic macroinvertebrate populations, color, and odor are also considered. These factors are interrelated in a complex manner and their interpretation is necessarily showewhat subjective.

The following ranges used to classify sediments from Great Lakes harbors are based on compilations of data from over 100 different harbors since 1967.

	NONPOLLUTED	MODERATELY POLLUTEL	HEAVILY POLLUTED
Volatile Solids (%)	<5	5 - 8	>8
COD (mg/kg dry weight)	<40,000	40,000-80,000	>80,000
TKN " " "	<1,000	1,000-2,000	>2,000
Oil and Grease (Hexane Solubles) (mg/kg dry weight)	<1,000	1,000-2,000	>2,000
Lead (mg/kg dry weight)	<40	40-60	>60
Zinc " " "	<90	90-200	>200

The following supplementary ranges used to classify sediments from Great Lakes harbors have been developed to the point where they are usable but are still subject to modification by the addition of new data. These ranges are based on 260 samples from 34 harbors sampled during 1974 and 1975.

	NONPOLLUTED	MODERATELY POLLUTED	HEAVILY POLLUTED
Ammonia (mg/kg dry weight)	<75	75-200	>200
Cyanide " " "	<0.10	0.10-0.25	>0.25
Phosphorus " " "	<420	420-650	>650
Iron " " "	<17,000	17,000-25,000	>25,000
Nickel " " "	<20	20-50	>50
Manganese " " "	<300	300-500	>500
Arsenic " " "	<3	3-8	>8
Cadmium " " "	*	*	>6
Chromium " " "	<25	25-75	>75
Barium " " "	<20	20-60	>60
Copper " " "	<25	25-50	>50

*Lower limits not established

The guidelines stated below for mercury and PCB's are based upon the best available information and are subject to revision as new information becomes available.

Methylation of mercury at levels $\geq$ mg/kg has been documented (1,2). Methyl mercury is directly available for bioaccumulation in the food chain.

Elevated PCB levels in large fish have been found in all of the Great Lakes. The accumulation pathways are not well understood. However, bioaccumulation of PCB's at levels $\geq$ 10 mg/kg in fathead minnows has been documented (3).

Because of the known bioaccumulation of these toxic compounds, a rigid limitation is used. If the guideline values are exceeded, the sediments are classified as polluted and unacceptable for open lake disposal no matter what the other data indicate.

	POLLUTED
Mercury	$\geq$ 1 mg/kg dry weight
Total PCB's	$\geq$ 10 mg/kg dry weight

The pollutional classification of sediments with total PCB concentrations between 1.0 mg/kg and 10.0 mg/kg dry weight will be determined on a case-by-case basis.

a. Elutriate test results.

The elutriate test was designed to simulate the dredging and disposal process. In the test, sediment and dredging site water are mixed in the ratio of 1:4 by volume. The mixture is shaken for 30 minutes, allowed to settle for 1 hour, centrifuged, and filtered through a 0.45 μ filter. The filtered water (elutriate water) is then chemically analyzed.

A sample of the dredging site water used in the elutriate test is filtered through a 0.45 μ filter and chemically analyzed.

A comparison of the elutriate water with the filtered dredging site water for like constituents indicates whether a constituent was or was not released in the test.

The value of elutriate test results are limited for overall pollutional classification because they reflect only immediate release to the water column under aerobic and near neutral pH conditions. However, elutriate test results can be used to confirm releases of toxic materials and to influence decisions where bulk sediment results are marginal between two classifications. If there is release or non-release, particularly of a more toxic constituent, the elutriate test results can shift the classification toward the more polluted or the less polluted range, respectively.

b. Source of sediment contamination.

In many cases the sources of sediment contamination are readily apparent. Sediments reflect the inputs of paper mills, steel mills, sewage discharges, and heavy industry very faithfully. Many sediments may have moderate or high concentrations of TKN, COD, and volatile solids yet exhibit no evidence of man made pollution. This usually occurs when drainage from a swampy area reaches the channel or harbor, or when the project itself is located in a low lying wetland area. Pollution in these projects may be considered natural and some leeway may be given in the range values for TKN, COD, and volatile solids provided that toxic materials are not also present.

c. Field observations.

Experience has shown that field observations are a most reliable indicator of sediment condition. Important factors are color, texture, odor, presence of detritus, and presence of oily material.

Color. A general guideline is the lighter the color the cleaner the sediment. There are exceptions to this rule when natural deposits have a darker color. These conditions are usually apparent to the sediment sampler during the survey.

Texture. A general rule is the finer the material the more polluted it is. Sands and gravels usually have low concentrations of pollutants while silts usually have higher concentrations. Silts are frequently carried from polluted upstream areas, whereas, sand usually comes from lateral drift along the shore of the lake. Once again, this general rule can have exceptions and it must be applied with care.

Odor. This is the odor noted by the sampler when the sample is collected. These odors can vary widely with temperature and observer and must be used carefully. Lack of odor, a beach odor, or a fishy odor tends to denote cleaner samples.

Detritus. Detritus may cause higher values for the organic parameters COD, TKN, and volatile solids. It usually denotes pollution from natural sources. Note: The determination of the "naturalness" of a sediment depends upon the establishment of a natural organic source and a lack of man made pollution sources with low values for metals and oil and grease. The presence of detritus is not decisive in itself.

Oily material. This almost always comes from industry or shipping activities. Samples showing visible oil are usually highly contaminated. If chemical results are marginal, a notation of oil is grounds for declaring the sediment to be polluted.

d. Benthos.

Classical biological evaluation of benthos is not applicable to harbor or channel sediments because these areas very seldom support a well balanced population. Very high concentrations of tolerant organisms indicate organic contamination but do not necessarily preclude open lake disposal of the sediments. A moderate concentration of oligochaetes or other tolerant organisms frequently characterizes an acceptable sample. The worst case exists when there is a complete lack or very limited number of organisms. This may indicate a toxic condition.

In addition, biological results must be interpreted in light of the habitat provided in the harbor or channel. Drifting sand can be a very harsh habitat which may support only a few organisms. Silty material, on the other hand, usually provides a good habitat for sludgeworms, leeches, fingernail clams, and perhaps, amphipods. Material that is frequently disturbed by ship's propellers provides a poor habitat.

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1. Jensen, S., and Jernelov, A., "Biological Methylation of Mercury in Aquatic Organisms," Nature, 223 August 16, 1969 pp 753-754.

2. Magnuson, J.J. Forbes, A., and Hall, R., "Final Report - An Assessment of the Environmental Effects of Dredged Material Disposal in Lake Superior - Volume 3: Biological Studies," Marine Studies Center, University of Wisconsin, Madison, March, 1976.

3. Halter, M.T., and Johnson, H.E., "A Model System to Study the Release of PCB from Hydrosoils and Subsequent Accumulation by Fish," presented to American Society for Testing and Materials, Symposium on Aquatic Toxicology and Hazard Evaluation," October 25-26, 1976, Memphis, Tennessee

APPENDIX B

VEGETATION AND FAUNA DATA

Phytosociology of an Old-Field Succession
NORTH SHORE OF BETSIE LAKE
Frankfort, Michigan

Table J-2. Partial List of Plants,
Site 9(1-3), Fife Lake State Forest

Table K-1, Status of Wildlife as
of 1970, Northern Lower Michigan

List of the Common and Scientific
Names of the Flora and Fauna
Included in the Text of the EIS

Biological Survey of Lake Betsie
Benzie County, Michigan
(MDNR 1966)

Benthic Animals from Lake Betsie,
Benzie County, Michigan
(MDNR 1975)

Phytosociology[1] of an Old-Field Succession

NORTH SHORE OF BETSIE LAKE

Frankfort, Michigan

Benzie County: T26N, R16W, Sec. 27 - NE 1/4

July 9, 1977

Location:	North Shore of Betsie Lake			
Elevation (ft.):	ca. 590			
Geology:	Post-Glacial Lake Basin			
Topographic Position:	Shoreline			
Slope (%) and Exposure:	0 -2 SW			
Drainage Condition:	Poor to Well			
Ground Water Table (ft.):	6+			
Soil Type:	Fill			
Land Use:	Dump			
Waste Assimilation Capacity:	Extremely Unsuitable			
Plot No.	1	2	3	4
Plot Size (1/10 acre)(ft.):	66 x 66	66 x 66	66 x 66	66 x 66
Shrub Stratum:				
Crown Closure (%)	3	3	15	50
Height (ft.)		0.8 to 15		
Salix interior (Sandbar-willow)	+	+	2	3
Salix (amygdaloides) (Peach-leaf willow)	+	+	1	2
Salix glaucophylloides (Dune willow)	-	-	1	+
Salix (petiolaris)(Willow)	-	-	+	+
Sambucus canadensis (Common Elder)	-	-	+	-
Herbaceous Stratum:				
Crown Closure (%)	55	50	40	15
Height (ft.)		0.5 to 4.1		
Cirsium vulgare (Bull Thistle)	3 f.	2 f.	+f.	+
Oenothera biennis (Evening-Primrose)	2 f.	1 f.	1 f.	+

Lychnis alba (White Campion)	1 f.+fr.	2 f.+fr.	+f.	+
Chenopodium album (Goosefoot)	2	3	1	+
Melilotus alba (Sweet-Clover)	2 f.	2 f.	+	-
Convolvulus sepium (Bindweed)	2 f.	1 f.	+f.	-
Berteroa incana (Hoary Alyssum)	3 f.	1 f.	+	-
Potentilla anserina (Silver Cinquefoil)	1 f.	+f.	+f.	-
Daucus carota (Wild Carrot)	+f.	1 f.	+	-
Agrostis stolonifera (Creeping Bent)	+f.	+f.	+f.	-
Arctium minus (Burdock)	2	+	1	-
Solanum dulcamara (Nightshade)	+f.	+f.	-	+f.
Plantago major (Plantain)	+f.+fr.	1f.+fr.	-	-
Plantago lanceolata (Plantain)	+f.	+f.	-	-
Verbascum thapsus (Mullein)	1 f.	+f.	-	-
Saponaria officinalis (Bouncing Bet)	+f.	+f.	-	-
Solidago (rugosa)(Goldenrod)	+	1	-	-
Barbarea vulgaris (Winter Cress)	+f.+fr.	+f.+fr.	-	-
Polygonum persicaria (Smartweed)	+	+	-	-
Trifolium repens (Clover)	+f.	+	-	-
Panicum (oligosanthes)(Panic Grass)	+fr.	+fr.	-	-
Euphorbia cyparissias (Spurge)	+f.+fr.	+	-	-
Rumex crispus (Curly Dock)	+ fr.	-	-	-
Ambrosia artemisiifolia (Ragweed)	+	-	-	-
Equisetum arvense (Horsetail)	-	+	2	-
Asclepias syriaca (Milkweed)	-	+f.	+	-
Thlapsi arvense (Penny Cress)	-	1f.+fr.	+fr.	-
Solidago canadensis/altissima (Goldenrod)	-	+	1	-
Urtica dioica (Stinging nettle)	-	+	1	1
Solidago graminifolia (Goldenrod)	-	+	+	+
Scirpus acutus (Hardstem Bulrush)	-	-	1 fr.	+fr.
Leonurus cardiaca (Motherwort)	-	-	+f.	+
Sisymbrium altissimum (Tumble Mustard)	-	-	+	+

Melilotus officinalis (Sweet-Clover)	-	-	+f.	-
Juncus effusus (Rush)	-	-	+fr.	-
Juncus nodosus (Rush)	-	-	+fr.	-
Carex (comosa) (Sedge)	-	-	+fr.	-
Adjacent Species:				
Poa pratensis (f.)(Kentucky Bluegrass)				
Glyceria (canadensis)(f.) (Rattlesnake Grass)				
Agropyron repens (f.)(Quack Grass)				
Bromus erectus (f.)(Brome Grass)				
Ground Stratum:				
Ground Cover (%)	5	10	25	5
Height (ft.)		0.1		
Fill (%) Exposed	45	40	40	30
Equisetum (scirpoides)(Horsetail)	1	2	3	1

---

[1] Cover values and notations for species:
+ - >1%; 1 - 1% to 5%; 2 - 6% to 25%; 3 - 26% to 50%;
4 - 51% to 75%; 5 - 76% to 100%. Fr. - fruit; f. - flower.

Table J-2. Partial List of Plants, Site 9(1-3),
Fife Lake State Forest
August 23, 1977.

Site 9 Area Presence	Species
Vascular Plants	
1, 2, 3	St. John's-wort, Hypericum perforatum L.
1, 2, 3	Strawberry, Fragaria virginiana Duchesne
1, 2, 3	Hawkweed, Hieracium aurantiacum L.
1, 2, 3	Witch Grass, Panicum capillare L.
1, 2, 3	Black Raspberry, Rubus occidentalis L.
1, 2, 3	Staghorn Sumac, Rhus typhina L.
1, 2, 3	Black Cherry, Prunus serotina Ehrh.
1, 2	Juneberry, Amelanchier (spicata) (Lam.) k. koch
1, 2	Elm, Ulmus americana L.
1, 3	Star Thistle, Centaurea maculosa Lam.
1, 3	Milkweed, Asclepias syriaca L.
1, 3	Cinquefoil, Potentilla recta L.
1, 3	Pearly Everlasting, Anaphalis margaritacea (L.) Benth. & Hook.
1	Hairy Vetch, Vicia villosa Roth
1	Sheep Sorrel, Rumex acetosella L.
1	Black Spruce, Picea mariana (Mill.) B.S.P.
1	White Spruce, Picea glauca (Moench) Voss
1	Apple, Pyrus Malus L.
2	Witch Hazel, Hamamelis virginiana L.
2	Sugar Maple, Acer saccharum Marsh
2	Basswood, Tilia americana L.
2	Ironwood, Ostrya virginiana (Mill.) k. koch
2	White Ash, Fraxinus americana L.
3	Hawkweed, Hieracium longipilum Torr.
3	Hawkweed, Hieracium floribundum Wimmer & Grab.

Lichens and Mosses[1]

1, 2, 3	Cladonia cristatella Tuck (3)
1, 2, 3	Cladonia chlorophaea (Flk.) Spreng. (2)
1, 2, 3	Cladonia gracilis (L.) Willd. (2)
1, 2, 3	Cladonia mitis Sandst. (1)
1, 2, 3	Cladonia rangiferina Wigg. (+)
1, 2, 3	Cladonia subtenuis (Abb.) Evans (+)
1, 3	Cladonia caespiticia (Pers.) Floerke (1)
1, 3	Cladonia pleurota (Floerke) Schaer. (1)
1, 3	Cladonia coniocraea (Floerke) Spreng. (+)
1, 3	Cladonia fimbriata (L.) Fr. (+)
1, 3	Cladonia nemoxyna (Ach.) Nyl. (+)
1, 3	Cladonia uncialis (L.) Wigg. (+)
1, 2, 3	Candelaria concolor (Dicks.) B. Stein (2)
1, 2, 3	Parmelia aurulenta Tuck. (2)
1, 2, 3	Parmelia rudecta Ach. (2)
1, 2, 3	Parmelia sulcata Tayl. (2)
1, 2, 3	Parmelia caperata (L.) Ach. (1)
1, 2, 3	Physcia millegrana Degel. (1)
1, 3	Pyxine sorediata (Ach.) Mont. (+)
1	Stereocaulon tomentosum Fr. (+)
1, 2, 3	Polytrichum piliferum Hedw. (3)
2	Dicranum polysetum Sev.
2	Thuidium delicatulum (Hedw.) BSG

[1]Cover values are given for the lichens and mossess occurring on Site 9-1, as: + - 0 to 1%; 1 - 1 to 5%; 2 - 6 to 25%; 3 - 26 to 50%; 4 - 51 to 75%; 5 - 76%+.

TABLE K-1

STATUS OF WILDLIFE AS OF 1970
Northern Lower Michigan[4]

Class and Species	Planning Subarea 2,4--Michigan Density	Trend	Notes
BIG GAME			
White-tailed Deer	Medium	Decreasing	
Black Bear	Low	Decreasing	
Turkey	Low	Increasing	
WATERFOWL			
Ducks	Medium	Stable	
Geese	Medium	Increasing	
SMALL GAME			
Cottontail Rabbit	High	Stable	
Ring-necked Pheasant	Low	Stable	
Ruffed Grouse	High	Increasing	
Gray Squirrel	Medium	Increasing	
Fox Squirrel	Medium	Increasing	
Snowshoe Hare	Low	Decreasing	
Woodcock	High	Increasing	
Mourning Dove	Medium	Stable	
Bobwhite Quail	Low	Decreasing	
FURBEARERS			
Muskrat	Medium	Decreasing	
Mink	Medium	Stable	
Beaver	High	Stable	
Weasel	Medium	Stable	
Raccoon	High	Increasing	
Otter	Low	Decreasing	
Skunk	High	Increasing	
Opossum	Medium	Increasing	
Badger	Low	Stable	
NON-GAME			
Woodchuck	Medium	Stable	
Porcupine	Low	Decreasing	
Red Fox	Medium	Stable	
Bobcat	Low	Decreasing	
Crow	High	Increasing	
Raven	Low	Stable	

Table K-1
Cont'd

Class and Species	Density	Trend	Notes
Red Squirrel	Medium	Increasing	
Coyote	Low	Stable	
Raptors	Medium	Stable	
RARE (R) ENDANGERED (E) STATUS UNDETERMINED (S)[1]			
Bald Eagle (E)[2]	Low	Decreasing	
American Osprey (S)	Low	Decreasing	
No. Gr. Prairie Chicken (R)	Low	Decreasing	Missaukee and Osceola Counties
Kirtlands Warbler (E)	Low	Stable	
Eastern Pigeon Hawk (S)			Rare transient
UNUSUAL OR UNIQUE ANIMALS[3]			
Sandhill Crane	Low	Increasing	
Spruce Grouse	Low	Decreasing	
Golden Eagle			Rare transient
Sharp-tailed Grouse	Low	Decreasing	Lower Peninsula

[1] Rare and Endangered Fish and Wildlife of the United States, U.S. Bureau of Sport Fisheries and Wildlife, 1968 Edition. Also based on February 1972 data from the Bureau's Office of Endangered Species.

[2] For the purpose of this appendix the northern and southern subspecies of bald eagle are listed as bald eagle, the endangered status being the important consideration.

[3] Animal species considered to be unusual or unique on a regional, State, or planning subarea basis.

[4] Modified from Great Lakes Basin Framework Study, Appendix 17, Wildlife. 1975.

LIST OF THE COMMON AND SCIENTIFIC NAMES OF THE FLORA AND FAUNA INCLUDED IN THE TEXT OF THE EIS.

The species are arranged within the various groups as they are first given in the text. Species observed during the field inventory reported for the project area are listed, unless otherwise (*) indicated.

Vascular Plants[1] -

Sugar Maple, Acer saccharum Marsh
Yellow Birch, Betula alleghaniensis
Basswood, Tilia americana L.
American Elm, Ulmus americana L.
Black Cherry, Prunus serotina Ehrh.
White Pine, Pinus strobus L.
Hemlock, Tsuga canadensis (L.) Carr.
Beech, Fagus grandifolia Ehrh.
Aspen, Populus grandidentata Michx. and P. tremuloides
White Birch, Betula papyrifera Marsh
Black Spruce, Picea mariana (Mill.) BSP

Sandbar Willow, Salix interior Rowlee
Peach-leaf Willow, S. amygdaloides Anderss.
Dune Willow, S. glaucophylloides Fern.
Apple, Pyrus Malus L.

Bull Thistle, Cirsuim vulgare (Savi) Tenore
Evening-primrose, Oenothera biennis L.
White Campion, Lychnis alba L.
Goosefoot, Chenopodium album L.

Sweet-clover, Melilotus alba Desr.
Hoary Alyssum, Berteroa incana (L.) DC.

Mammals[2] -

White-tailed Deer, Odocoileus virginianus Miller
Deer Mouse, Peromyscus maniculatus Hoy and Kennicott
Woodchuck, Marmota monax L.
Thirteen-lined Ground Squirrel, Citellus tridecemlineatus Mitchell

Birds[3] -

Ruffed Grouse, Bonasa umbellus
Blue Jay, Cyanocitta cristata
Crow, Corvus brachyrhynchos
Black-capped chickadee, Parus atricapillus
Hairy Woodpecker, Dendrocopos villosus
American Goldfinch, Spinus tristis
Vesper Sparrow, Pooecetes gramineus
Song Sparrow, Melospiza melodia
Alder Flycatcher, Empidonax traillii
Herring Gull, Larus argentatus
Mute Swan, Cygnus olor
Canada Goose, Branta canadensis

Fishes[4] -

Alewife, Alosa pseudoharengus Wilson
*Round Whitefish, Prosopium cylindraceum Pallas
*Rainbow Smelt, Osmerus mordax Mitchill
Northern Pike, Esox lucius L.

Carp, Cyprinus carpio L.
White Sucker, Catostomus commersoni Lacepede
Black Bullhead, Ictalurus melas Rafinesque
Brown Bullhead, Ictalurus nebulosus Lesueur
Green Sunfish, Lepomis cyanellus Rafinesque
Bluegill, Lepomis macrochirus Rafinesque
Yellow Perch, Perca flavescens Mitchill
*Lake Trout, Salvelinus namaycush Walbaum
*Brown Trout, Salmo trutta L.
*Steelhead, Salmo gairdneri Richardson

[1] Vascular plant nomenclature follows Gleason, H.A. and A. Cronquist. 1963. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. D. Van Nostrand Co., Inc., Princeton, N.J. viii + 810 p.

[2] Mammal scientific names follow Burt, W.H. 1954. The Mammals of Michigan. The University of Michigan Press, Ann Arbor. 287 p.

[3] Scientific names for birds are those of the American Ornithologists' Union (Check-List of North American Birds, 5th Edition).

[4] Fish nomenclature follows Scott, W.B. and E.J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Res. Board, Canada. ix + 966 p.

A biological Survey of Lake Betsie, Benzie County, Michigan
November 14-16, 1966

This survey was conducted at the request of District Engineer, George F. Liddle, Jr. This survey commenced following receipt of complaints from several residents concerning the poor water quality of Betsie Lake.

Commission biologist William C. Bryant and D. James Seeburger, made an investigation of Betsie Lake on November 14-16. The purpose of the survey was to determine the effects of local waste discharges on the physical appearance and macroinvertebrate life in the lake.

Several industrial and municipal waste discharges enter Lake Betsie. The known waste discharge sources were: 1) the Frankfort Wastewater Treatment Plant (WWTP) 2) the Elberta Wastewater Treatment Plant 3) the Pet Milk Company, and 4) the Elberta Packing Company.

Methods

Quantitative collections of the bottom-dwelling macroinvertebrates were made by singl dredge hauls with a Ponar dredge. U.S. Standard #30-mesh soil sieves were used for sieving the samples which were then fixed with formalin and labeled. Organisms were washed, sorted, identified and tabulated in the Lansing laboratory. Animals were assigned a tolerance status according to published accounts and past experience of the author. Tolerance status refers to the animal's relative ability to withstand and/or respond to adverse environmental conditions. Individual tolerances are generally derived from an animal's reaction to organic wastes and attendant oxygen depletion.

Tolerant status terms may generally be defined as:

Tolerant - organisms that can withstand a variety of adverse environmental conditions and often respond by becoming more abundant while less tolerant animals respond by becoming less abundant.

Intolerant - organisms found only within a narrow range of optimum environmental conditions, rarely found in waters of poor quality.

Facultative - organisms with the ability to survive over a wide range of conditions. They possess "medium" tolerance and often respond positively to moderate organic enrichment. Some aquatic animals independent of dissolved oxygen content are included in this category by the author. In addition to tolerance status, the diversity of animals present in a given benthic community is significant. In general, pollutional communities are characterized by very low species diversity, while normal undisturbed communities contain many different species.

The following information was recorded at each lake sampling station: depth, surface water temperature, Secchi disk reading, bottom sediment type and odor, and general observations. This information is included in Table 1.

Shoreline Observations

The Elberta WWTP effluent enters the Betsie River at the M-22 highway bridge. The nearby downriver area had an abundant micro-biological slime growth. The Betsie River surface water temperature above the outfall was 39° F.

Station A(Figure 1) was located along the Lake Betsie shoreline near the Elberta WWTP. This area was relatively shallow, sluggish and showed signs of enrichment. The following animals were found on pieces of bark and wood; 2 physa snails, 3 sowbugs, 5 scuds, 2 dragonflies, and 1 mayfly. A concrete slab was covered with numerous aquatic sowbugs.

Station B(Figure 1) was a small creek adjacent to 9th Street in Frankfort. This creek had a clear effluent of about 20 gallons per minute. The biologists conducting this survey thought they could detect a slight septic odor but were uncertain because the stream banks were covered with dense growths of nightshad which gave off an odor which masked other odors. Small amounts of biological slime growths were present. There were many aquatic sowbugs and scuds in the stream.

Station C(Figure 1) was along the shore of Lake Betsie where the Frankfort WWTP discharge pipe enters the lake. No chorine odor was present. Light to thick deposit of cherry pits were noted along the shore east of the outfall. Abundant slime growths were found at least 90 yards east of the discharge. The shoreline was cluttered with old car bodies, stoves, concrete slabs and other junk.

Station D(Figure 1) was located along the west ditch of Pet Milk Company. The waters of this ditch were black, very turbid and had a strong septic odor. The only animals present in the ditch were aquatic sowbugs and syrphid larvae(rat-tailed maggots).

Station E(Figure 1) was along the east discharge ditch of Pet Milk Company. This ditch had an abundant slime growth and a strong septic odor. There was a large bed of water-cress 15 yards upstream from Lake Betsie.

Station F(Figure 1) was at the shoreline area in front of Elberta Packing Company. Two discharge pipes enter the lake in front of this plant. On November 14, 1966 a 6 inch discharge pipe was discharging a dark brown waste which had a distinct cider odor. Many Canadian geese were feeding in the area adjacent to the outfalls.

Discussion

The twenty-seven lake sampling station locations are shown in Figure 1. In order to facilitate interpretation of the macroinvertebrate findings of this survey the stations have been divided into six groups(area I, area II, area III, area IV, area V, and area VI) based on their proximity to various waste discharges and physica features of the lake. Stations in area I were in the deepest portion of the lake (20 to 22 feet). Those in area II were in 5 to 9 feet of water in the center portion of the lake, those in area III (at 3.5 to 6 foot depth) were nearest to the Frankfort WWTP, those in area IV(at 2 to 5 foot depths) were in the vicinity of the Pet Milk Company's two discharge ditches, those in area V(5 foot depth were nearest to the Elberta Packing Company discharges and those in area VI(1.5 to 4.5 foot depth) were mid-lake in the relatively shallow eastern end. Station 27 was taken in the Betsie River above all municipal and industrial waste discharges.

Tabulation of the analysis of benthic fauna samples from all stations is presented in Table 2. From those data all other summaries and conclusions relative to the benthic community are derived. Figure 1 graphically portrays the total number of species collected as well as the number of species in each of the tolerance groups (intolerant, facultative, tolerant).

Area I Stations 1 through 3:

Benthic samples were taken in this area at depths between 20 and 22 feet. Bottom deposits were silt, sand and fibrous materials which had a slight septic sewage odor. The average number of animals per square foot was highest in area 1 due to the large populations of tolerant sludgeworms(Tubificidae) and tolerant midge larvae(Tendipes). Only two other types of animals(scuds and damselflies) were found in this area. An extremely large number of tubificids(62,983/square foot) was found at station three. A preponderence of tubificid worms such as occurred at station three is indicative of poor water quality.

Of the nine species present in area 1, four were tolerant, four were faculative and one was intolerant(Figue 2).

Area II Stations 4 through 7:

Samples of the bottom-dwelling animals in this area were taken from depths between five and nine feet. Bottom deposits consisted of sand, silt, organic debris and plant detritus. The average number of macroinvertebrate animals per square foot was 204 of which tolerant tubificid worms(188/square foot) were the most abundant followed by midge larvae, amphipods and mayflies. Although a few intolerant amphipods(4) and intolerant mayflies(2) were present, it was apparent that the water quality was similar to that in area 1.

Of the nine species present in area 1, 4 were tolerant, 3 were facultative and 2 were intolerant.

Area III Stations 8 through 13

Samples of the bottom-dwelling animals in this area were taken at distances ranging from 15 to 90 yards from the Frankfort WWTP outfall. Bottom deposits consisted of silt, sludge, vegetative detritus, sand, relic shells and detritus. At station 13 the bottom sediments had a slight sewage odor. All samples were collected between depths of $3\frac{1}{2}$ and 6 feet. The average number of animals per square foot was 100 and of these 86% were tolerant tubificid worms and 14% tolerant and facultative midge larvae. The bottom fauna of area III was similar to that of area II except for the absence of all intolerant animals.

Of the nine species present five were tolerant and four were facultative.

Area IV Stations 14 through 19

Benthic samples in this area were taken between 35 and 80 yards off the two Pet Milk Company discharge ditches. Bottom deposits consisted of relic shells, fine sand, silt, cherry pits and various types of detritus. The water depth was between $2\frac{1}{2}$ and 5 feet. A slight sewage and/or septic odor was detected at stations 16 and 17. The benthic-macroinvertebrate population living in this area was dominated by tolerant tubificid worms(75%) and tolerant and facultative midge larvae(25%).

Of the nine species of animals present 4 were facultative, 5 were tolerant and none were intolerant.

Area V Stations 20 through 24

Samples of the bottom-dwelling animals were taken in this area at distances ranging from 20 to 85 yards off the Elberta Packing Company discharges at depths of 5 feet. Bottom sediments were silt, muck, sludge, fine sand, plant detritus and relic snail shells. The bottom sediments had moderate to strong septic odors at stations 20 through 23. The average number of benthic-macroinvertebrates was 77 per square foot. The dominate animals in area V were tolerant and facultative midge larvae(53%). Tubificid worms were the second most abundant animals(46%).

In area V there were 12 species which represents an increase of three over areas I, II, III, and IV. Of the 12 species present 1 was intolerant, 6 were facultative and 5 were tolerant Although there were more species present in this area, they were either tolerant or facultative which indicates that the water quality had not improved substantially over the previously mentioned areas.

Area VI Stations 25 and 26

Stations 25 and 26 were located near mid-lake in the relatively shallow southeastern portion of Lake Betsie. The bottom samples were collected from a depth of $1\frac{1}{2}$ and $4\frac{1}{2}$ feet. The bottom deposits consisted of sand, silt, and detritus. The average number of benthic animals per square foot was 133. Of these 71 were tolerant tubificid worms and 59 tolerant or facultative midge larvae.

This area was occupied by seven different species of which 4 were facultative and 3 were tolerant.

Betsie River Control Station 27

A Ponar dredge sample was taken midstream and other organisms were qualitatively collected along the river banks. The two samples were then combined to form one qualitative sample for this station. The main river bed had a sand bottom while along the river banks there were rocks and silt deposits. The most abundant organisms were flatworms(Dugesia sp.), amphipods(Gammarus sp.), and mayflies(Heptagenia sp.). Sow bugs(Asellus militaris) and snails(Physa sp.) were common in their occurance. Those organisms which were found only occasionally were leeches(Placobdella sp.), stoneflies(Isoperla sp.), Hemiptera(Corixdae), midge larvae(Tendipes sp.) and snails (Pleuroceridae). Those organisms which were found in only one location included mayflies(Baetisca laurentina), damselflies(Coenagrionidae), caddisflies(Neureclipsis) sp.), and beetles(Stenelmis sp.).

Of the 15 species present 6 were intolerant. 5 were facultative and 4 were tolerant. This station had a healthy balanced macroinvertebrate fauna.

Upon and within the bottom soils of a lake live large numbers of invertebrate animals. The many different types of bottom animals vary widely in their tolerance to pollution As wastes increase, a lake's bottom animals are eliminated in order of their sensitivety to the waste; the most sensitive organisms disappear first and the most tolerant ones, last. Usually mayflies, caddisflies and certain amphipods are the first to go, whereas sludgeworms and bloodworms can tolerate very heavy pollutional loads. A complete lack of bottom organisms indicates severe pollution and is often analogous to the absence of oxygen.

The physical and chemical changes produced by a wastewater outfall in a lake eliminates the organisms that require a clean habitat. At the same time these changes favor other organisms tolerant of these conditions. The elimination of sensitive predators and competitors makes life easier for the survivors. One of the most tolerant bottom organisms is the sludgeworm(Tubificidae), therefore their presence in large numbers, reflects poor water quality conditions.

The results of this biological survey in Betsie Lake, show that the tolerant sludgeworms and bloodworms were the dominate organisms at all stations. Unlike other similar lakes in Michigan, a very limited number of species were found in those areas where one would expect a high diversity of species. Usually in the littoral zone one can find an abundance of mayflies, amphipods, and other intolerant forms but these were very sparce or completely lacking in Betsie Lake. From this survey it was evident that the existing water quality could not support a balanced aquatic community.

Summary and Conclusions

1. During November of 1966, aquatic biologists of the Michigan Water Resources Commission, appraised the macroinvertebrate fauna in Betsie Lake. General shoreline observations were made in the vicinity of all known wastewater discharges.

2. Known wastewater discharges to Betsie Lake were: 1) the Frankfort WWTP, 2) the Elberta WWTP, 3) the Pet Milk Company, and 4) the Elberta Packing Company.

3. A total of 27 macroinvertebrate bottom samples were collected from six areas of the lake and one sample was collected from the Betsie River.

4. This biological survey showed that the tolerant sludgeworms and bloodworms were the dominate organisms at all lake stations.

5. A very limited number of species were found in those areas where one would expect a high diversity of species. Usually in the littoral zone one can find an abundance of mayflies, amphipods, and other intolerant forms but these were very sparce or completely lacking in Betsie Lake.

6. From the biological findings of this survey, it is evident that existing water quality cannot support a natural aquatic benthic community.

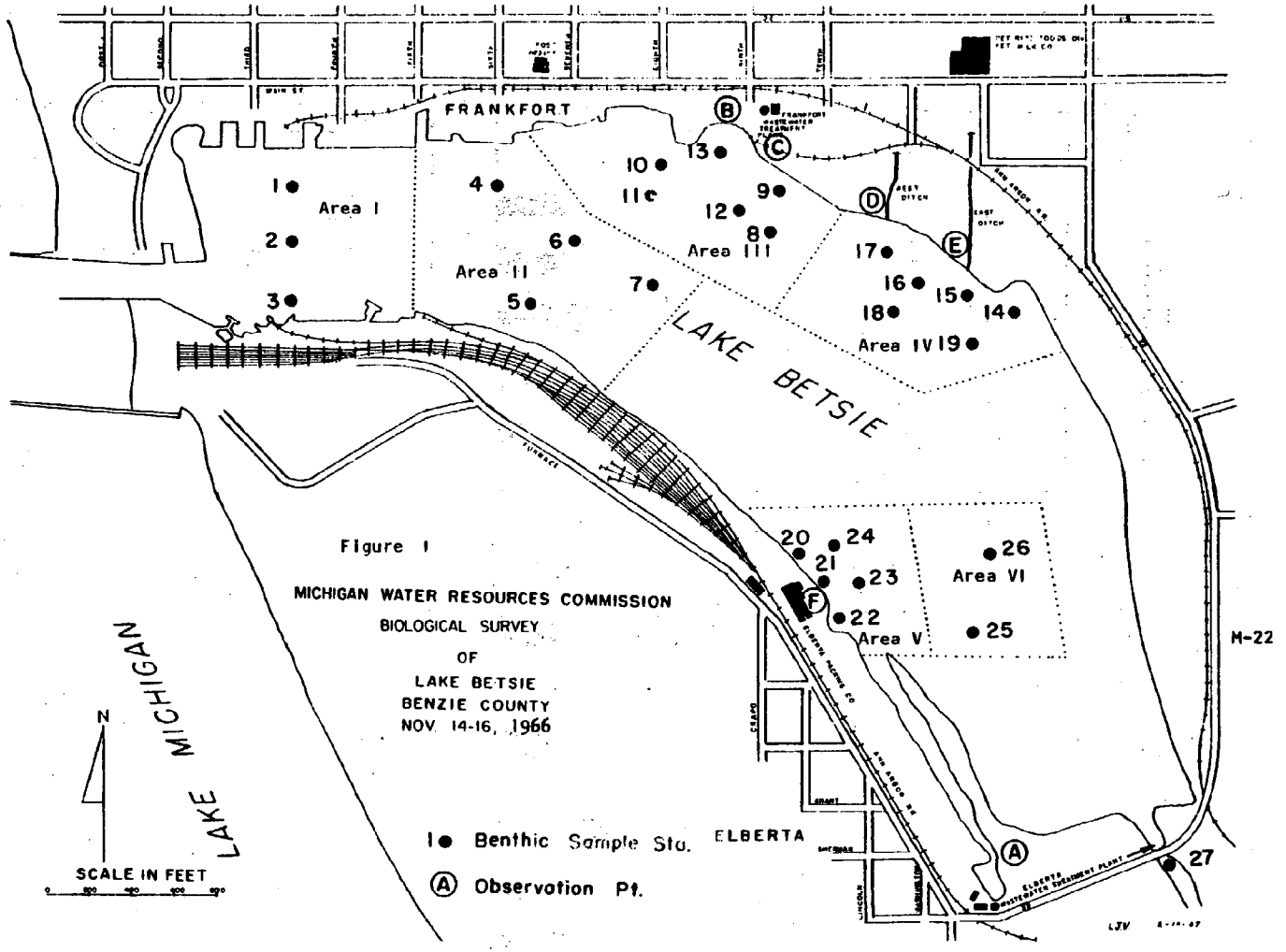


Figure 1

MICHIGAN WATER RESOURCES COMMISSION
BIOLOGICAL SURVEY
OF
LAKE BETSIE
BENZIE COUNTY
NOV. 14-16, 1966

Figure 2. Total number of species of bottom-dwelling macroinvertebrate animals and their tolerance status, Lake Betsie, Benzie County, Michigan, November 11-14, 1966

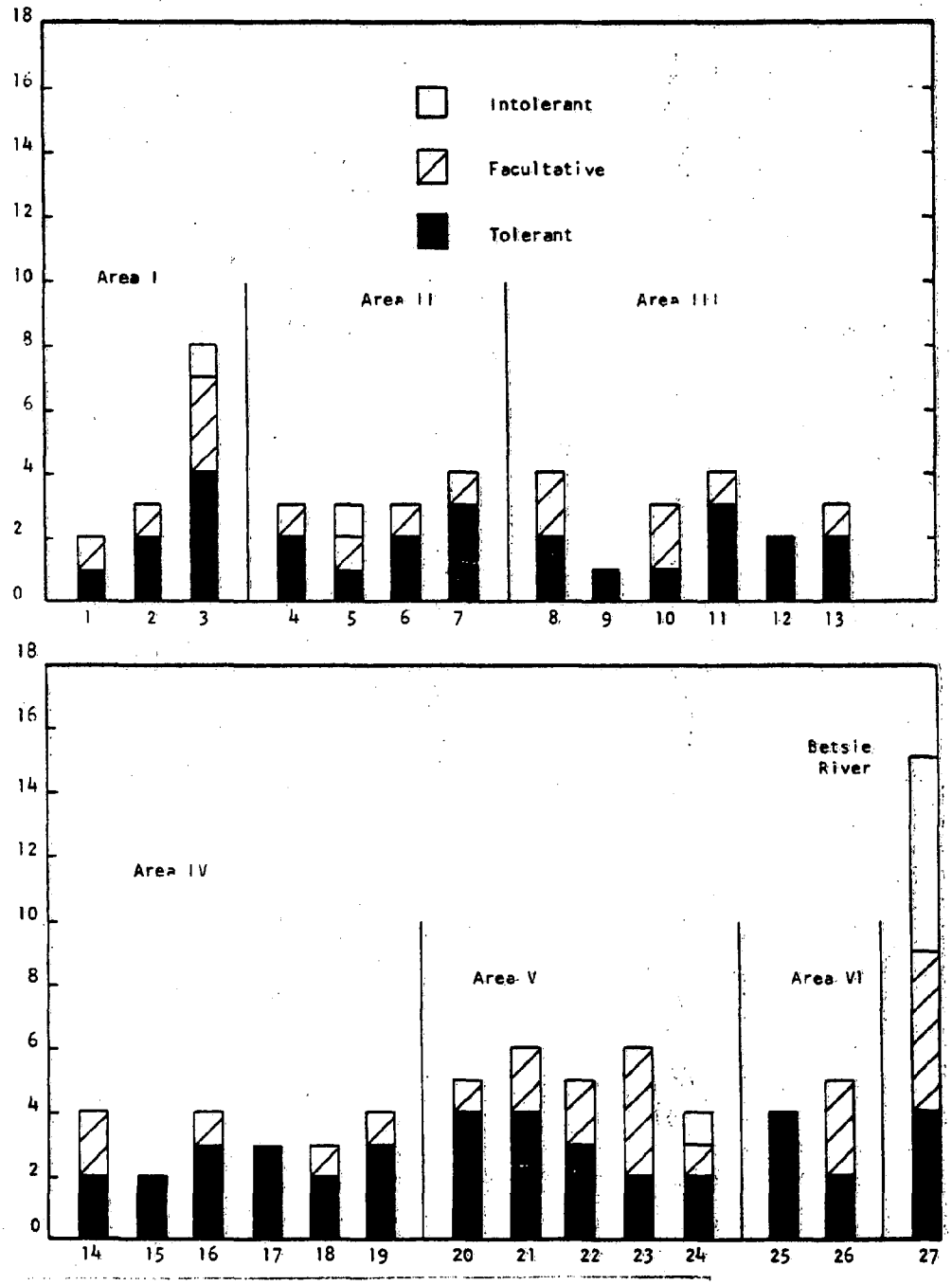


TABLE 1. FIELD DATA AS RECORDED DURING A BIOLOGICAL SURVEY OF BETSIE LAKE, BENZIE COUNTY, MICHIGAN, NOVEMBER 14-16, 1966.

STATION	LOCATION	TYPE OF SAMPLE	SAMPLING DEPTH IN FEET	SURFACE WATER TEMP. °F	SECCHI TRANS-PARENCY IN FEET	BOTTOM TYPE AND ODORS	REMARKS
1	50 yards off N. shore, west end out from middle car ferry dock	Ponar	22	37	4	5% fine sand, 95% silt, slight domestic sewage odor	Water color murky brown, no odor
2	Mid-lake, west end, out from mid-car ferry dock	Ponar	20	37	4	60% sand, 35% silt, 5% fibrous material	Water color murky brown, no odor
3	50 yards off S shore, west end, out from mid-car ferry dock	Ponar	22	37	4½	70% sand, 20% silt, 10% wood detritus, very slight septic sewage	Water color murky brown, no odor, saw many tubificidae and a few midges and scuds.
4	25 yards off N shore	Ponar	5	37	4	80% silt, 15% organic debris, 5% sand, moderate domestic sewage odor	Water color murky brown, saw a few midges and tubificidae
5	30 yards off S shore	Ponar	8-9	37	5	94% silt, 5% fibrous detritus, 1% fine sand	Water color murky brown, no odor, saw scuds and midges
6	Mid-lake south of Frankfort Post Office	Ponar	5-6	37	4	95% silt, 5% woody detritus, bottom material had a slight septic odor	Water color murky brown, no odor, saw several red midge larvae and cherry pits
7	Mid-lake south of 8th Street	Ponar	6	37	4	95% silt, 5% plant detritus, no abnormal bottom odor	Water color murky brown, saw midges, mayflies and cherry pits
8	90 yards offshore, south of 9th Street	Ponar	5-6	37	4-5	70% silt, 30% vegetative detritus, no abnormal odors	Water color murky brown, saw many midge larvae and cherry pits
9	20 yards offshore, ½ block east of 9th Street	Ponar	5½	37	5	50% silt, 50% sludge, moderate domestic sewage odor	Water color murky brown, no odor, saw tubificids and cherry pits
10	10 yards offshore, south of 8th Street	Ponar	5	37	4	90% silt, 5% sludge, 5% vegetative detritus, moderate sewage odor	Water quite turbid, murky brown, saw no animals
11	50 yards off N shore, south of 8th Street	Ponar	5½	37	4½	90% silt, 5% vegetative detritus, 3% sand and relic shells and 2% sludge, slight septic odor	Water color murky brown, saw no animals
12	45 yards off N shore, S of WWTP discharge pipe	Ponar	6	37	4½	90% silt, 5% fine sand, 5% vegetative detritus, slight septic odor	Water color murky brown, saw one midge larvae
13	15 yards off Frankfort WWTP discharge pipe	Ponar	3½	--	3½	50% bark, 30% sludge, 5% cherry pits, 10% silt, 5% vegetative detritus, moderate domestic sewage odor	Water color murky brown, moderate sewage odor, tubificids many
14	35 yards off N shore, out from 1st point E of Pet Milk Company, E drain	Ponar	3	37	3	70% relic shells, 25% woody detritus, 5% silt, no abnormal odor	Had trouble obtaining sample due to an abundance of bark and sticks, saw no organisms, cherry pits present
15	50 yards S of W Pet Milk Company drain	Ponar	2½	37	2½	60% relic shells, 20% fibrous vegetative detritus, 10% silt, 10% woody detritus	Water was turbid, saw one midge larvae and cherry pits
16	40 yards off shore, between the two Pet Milk Company drains	Ponar	2	37	2	45% bark, 45% relic shells, 10% cherry pits and fine sand	Water a turbid murky brown, slight septic odor, saw no animals, many cherry pits
17	40 yards off N shore, out from W Pet Milk Company drain	Ponar	2½	37	2½	65% fine sand, 20% silt, 10% relic shells, 5% vegetative detritus, moderate sewage odor	Water turbid brown, slight sewage odor, found several midges, cherry pits abundant
18	60 yards off N shore due S of 9th Street	Ponar	5	37	4½	40% relic shells, 20% silt, 20% woody detritus, 10% bark, slight septic odor	Water color murky brown, no odor, saw a few midges and cherry pits
19	80 yards offshore, S of E Pet Milk Company ditch	Ponar	4	37	4	70% sand, 25% relic shells, 5% silt, slightly septic odor	Water color murky brown, no odor, saw a few midges, tubificids and cherry pits
20	60 yards NW of Elberta Packing Company stack, 25 yards offshore	Ponar	5	37	4	50% fibrous vegetative detritus, 25% muck, 25% sludge, odor moderately septic	Water color murky brown, no odor, saw many midges
21	25 yards off Elberta Packing Company, W discharge pipes	Ponar	5	37	3½	50% muck, 50% sludge(yellowish slime, apple pulp, fibrous vegetative detritus), a few relic shells, strong septic odor	Water was a murky brown color, quite turbid, saw floating organic material over 200 yards offshore--came from Elberta Packing Company--saw a few midges
22	25 yards offshore, just E of Elberta Packing Company plant	Ponar	5	37	3	50% vegetative detritus, 25% muc , 24% silt, 1% fine sand, strong septic odor	Water color a murky brown, saw many midges
23	65 yards offshore, out from loading dock at Elberta Packing Company	Ponar	5	37	3	50% fibrous vegetative detritus, 25% muck, 24% silt, 1% sand, moderate septic odor	Water light brown, quite turbid, saw one mayfly and a few midges, also some cherry pits
24	85 yards offshore, 30 yards E of stack at Elberta Packing Company	Ponar	5	37	3	50% fibrous, woody and vegetative detritus, 20% silt, 10% muck, 9% sludge, 1% sand	Water turbid with an abundance of floating foam from Elberta Packing Company(brown apple pulp), found a few midges and mayflies
25	Mid-lake E of Elberta Packing Company due S of Pet Milk Company	Ponar	1½	37	1½	70% sand, 25% silt, 3% woody detritus, 2% vegetative detritus	Water color light brown, no odor, saw a few tubificids
26	Mid-lake due S of Pet Milk Company, 80 yards N of Station 25	Ponar	4½	37	4	70% silt, 30% woody and vegetative detritus	Water color light brown, no odor, saw a few midges
27	M-22 bridge on Betsie River	Ponar & Qualitative (25 man-minutes)	10-14	39	--	Mid-river sandy, some rocks and silt banks	Water color light brown, no odor saw scuds, sowbugs, corixidae, leeches, midges, and mayflies

TABLE 2. BENTHIC ANIMALS FOUND IN QUANTATIVE AND QUALITATIVE SAMPLES DURING A BIOLOGICAL SURVEY OF BETSIE LAKE, BENZIE COUNTY, MICHIGAN NOVEMBER 14-16, 1967. NUMERALS 0(occasional), and P(present).

Tolerance Status	Scientific Name	Station number:	1	2	3	4	5	6	7	8	9	10
		Type of Sample:	Ponar	Ponar	Ponar	Ponar	Ponar	Ponar	Ponar	Ponar	Ponar	Ponar
		Depth of sample:	22	20	22	5	8-9	5-6	6	5-6	5½	5
			← Area I →			← Area II →				← Area III →		
	Turbellaria (flatworms)											
F	Dugesia sp.											
	Oligachaeta (aquatic earthworms)											
T	Tubificidae		398	39	62,983	250	198	131	175	133	12	67
	Hirudinea (leeches)											
T	Placobdella sp.											
	Isopoda (sow bugs)											
F	Asellus militarsis											
	Amphipods (scuds)											
I	Gammarus sp.				2		4					
	Plecoptera (stoneflies)											
I	Isoperla sp.											
	Ephemeroptera (mayflies)											
I	Baetinae											
I	Baetisca laurentina											
I	Hexagenia sp.								2			
I	Heptagenia sp.											
I	Stenonema sp.											
	Odonata (dragonflies & damselflies)											
F	Coenagrionidae				2							
	Hemiptera (true bugs)											
F	Corixidae											
	Tricoptera (caddisflies)											
F	Hydropsyche sp.											
I	Neureclipsis sp.											
	Coleoptera (beetles)											
F	Stenelmis sp.											
	Diptera (true flies and midges)											
T	Psychoda											
F	Pentaneura flavifrons											
F	Pentaneura sp.									5		
F	Procladius adumbratus		11					4		2		4
F	Procladius culiciformis				89	2	2					
F	Procladius sp.			2	25	2						
F	Hydrobaenus sp.											
F	Cryptochironomus digitatus											2
F	Cryptochironomus sp.											
F	Pseudochironomus sp.											
T	Tendipes attenuatus											
T	Tendipes plumosus								32	42		
T	Tendipes riparius								4			
T	Tendipes staegeri				76							
T	Tendipes tuxis			2	71			9				
T	Tendipes sp.				9							
	Mollusca											
T	Pleuroceridae											
T	Physa sp.											
	Total number of animals per square foot		409	43	63,257	254	204	144	213	182	12	73
	Total number of species		2	3	8	3	3	3	4	4	1	3
	Total number of intolerant species		0	0	1	0	1	0	1	0	0	0
	Total number facultative species		1	1	3	1	1	1	0	2	0	2
	Total number of tolerant species		1	2	4	2	1	2	3	2	1	1

* T = tolerant, F = facultative, I = intolerant

INDICATE NUMBER OF ANIMALS PER SQUARE FOOT. RELATIVE ABUNDANCE OF ORGANISMS IN QUALITATIVE SAMPLES IS INDICATED BY VA(very abundant), A(abundant), C(common),

11 Ponar 5½	12 Ponar 6	13 Ponar 3½	14 Ponar 3	15 Ponar 2½	16 Ponar 2	17 Ponar 2½	18 Ponar 5	19 Ponar 4	20 Ponar 5	21 Ponar 5	22 Ponar 5	23 Ponar 5	24 Ponar 5	25 Ponar 1½	26 Ponar 4½	27 Qualitative ----
			Area IV						Area V					Area VI		Control
																A
62	23	221	104	21	136	179	28	27	104	21	27	18	14	122	20	
																O
																C
																A
																O
																P
													2			
																A
																O
																P
																O
																P
														5		P
		4														
			2								4	4				
										2	35		2			
4			2		2		16		16			11			12	
												2				
										2	7	11			4	
								4								
															2	
										2						
		4		4	7	11		24			28	30	18	44	55	
						9			7							
6			16					24	25	2						
6	4															
							39		2	2				2		O
																O
																C
78	27	229	124	25	145	199	83	79	154	31	101	76	36	173	93	--
4	2	3	4	2	3	3	3	4	5	6	5	6	4	4	5	15
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6
1	0	1	2	0	1	0	1	1	1	2	3	4	1	0	3	5
3	2	2	2	2	2	3	2	3	4	4	2	2	2	4	2	4

Table ____ Benthic animals found in "Petite Ponar" dredge samples from Betsie Lake, Benzie County, July 16, 1975.

	Station Number:	BL-1		BL-2		BL-3		BL-4		BL-5		BL-6		BL-7	
	Depth (ft.):	40		15		10		15		20		35		25	
	Substrate Type:	Gravel Sand		Silt Sand		Sand Silt Gravel		Silt		Cinders Coal Sand		Silt		Silt	
Tolerance	Sample:	A	B	A	B	A	B	A	B	A	B	A	B	A	B
F	Nematoda (roundworms)														
	Oligochaeta (aquatic earthworms)														
	Aulodrilus pigueti	43			129	172	86					645			
	A. pluciseta			516	473	1204	516		172	387	258	2150		688	86
F	Dero sp.														
T	D. digitata														
	Limnodrillus claparedianus														
T	Limnodrillus cervix						86	301	258	129	473		43		
T	L. hoffmeisteri	43	43	1032	344	1032	774	43	516	387	215	1720		1548	215
T	L. maumeensis														
F	Naididae														
F	Nais sp.														
	N. eliquis														
	Peloscolex freyi					172	172		86		43				
T	P. multisetosis longidentus														
T	P. multisetosis multisetosis			258	129										43
F	Potamothrix moldaviensis														
F	P. vejdovskyi						258								
	Slavina appendiculata														
	Immature with capilliform chaetae	43		129			86		172	215	86	215	43		
	Immature without capilliform chaetae	301	86	5289	1290	1720	2064	430	2064	1849	1247	7310	301	7740	258
	Pelecypoda (clams)					172									
T	Pisidium	43		43		86	86				86	43		172	
T	Sphaerium		43						129					86	86
	Isopoda (sow bugs)														
T	Asellus militaris				43								43		
	Amphipoda (scuds)														
F	Gammarus		215			129									
	Ephemeroptera (mayflies)														
I	Hexagenia limbata														
	Trichoptera (caddisflies)														
I	Philopotamidae						43								
	Diptera (flies, midges)														
I	Ceratopogonidae														
	Chironomidae (true midges)														
F	pupae											43			
T	Chironomus	43										43			
F	Cryptochironomous			86			43					215		129	43
F	Cryptotendipes														
T	Dicrotendipes														
T	Glyptotendipes														
F	Microtendipes														

Table ____ Benthic animals found in "Petite Ponar" dredge samples from Betsie Lake, Benzie County, July 16, 1975.

Tolerance	Station Number: / Depth (ft.): / Substrate Type: / Sample:	BL-8 20 Sand Gravel A	BL-8 20 Sand Gravel B	BL-9 20 Silt A	BL-9 20 Silt B	BL-10 20 Silt A	BL-10 20 Silt B	BL-11 20 Silt A	BL-11 20 Silt B	BL-12 10 Sand A	BL-12 10 Sand B	BL-13 10 Silt A	BL-13 10 Silt B	BL-14 10 Silt Detritus A	BL-14 10 Silt Detritus B
F	Nematoda (roundworms)														
	Oligochaeta (aquatic earthworms)														
	Aulodrilus pigueti						172	172		86		516	1204	2408	258
	A. pluciseta	258	430	86	516		258		344	387	86		86	258	
F	Dero sp.											86			
T	D. digitata											86		86	
	Limnodrilus claparedianus														215
	Limnodrilus cervix	129	258												172
T	L. hiffmeisteri	344	516	344	645		86	774	258		344	516	430	86	86
T	L. maumeensis											258			172
F	Naididae												86		
F	Nais sp.													86	86
	N. eliguis											86			
	Peloscolex freyi			172				86							
T	P. multisetosis longidentus													86	
T	P. multisetosis multisetosis		86	86	258	86	86	86	86		43	172	86	258	516
F	Potamothrix moldaviensis		86								43				
F	P. vejdovskyi		344								43				
	Slavina appendiculata													344	86
	immature with capilliform chaetae		172	86	516		86			86		1032	258	516	1806
	immature without capilliform chaetae	946	1462	2924	5160	3612	1548	2580	1978	817	1247	2494	1720	2924	1720
	Pelecypoda (clams)														
T	Pisidium		215												
T	Sphaerium	301													
	Isopoda (sow bugs)														
T	Asellus militaris														
	Amphipoda (scuds)														
F	Gammarus			86											
	Ephemeroptera (mayflies)														
I	Hexagenia limbata														
	Trichoptera (caddisflies)														
I	Philopotamidae														
	Diptera (flies, midges)														
I	Ceratopogonidae					43									
	Chironomidae (true midges)														
F	pupae					43		43							
T	Chironomus				43		344								
F	Cryptochironomous	43		43	43		43	43		43					
F	Cryptotendipes											43			
T	Dicrotendipes			43				86							
T	Glyptotendipes														
F	Microtendipes														

Table ____ Benthic animals found in "Petite Ponar" dredge samples from Betsie Lake, Benzie County, July 16, 1975.

	Station Number:	BL-15		BL-16		BL-17		BL-18		BL-19		BL-20		BL-21	
	Depth (ft.):	10		8		5		7		7		6		3	
	Substrate Type:	Silt		Silt		Silt		Silt		Silt Plant Remains		Silt Plant Remains**		Sand, Silt Plant Remains	
Tolerance	Sample:	A	B	A	B	A	B	A	B	A	B	A	B	A	B
F	Nematoda (roundworms)				258										
	Oligochaeta (aquatic Earthworms)						S								
	Aulodrilus pigueti	43	258				A	430	172	387	43	516			
	A. pluriseta	43	86		86		M	86	86	86					
F	Dero sp.						P								
T	D. digitata						L								
	Limnodrilus						E								
	Claparedianus														
T	Limnodrilus cervix						L								
T	L. hoffmeisteri	86	516	215	602	258	O	860	602	201	129	43		215	301
T	L. maumeensis						S								
F	Naididae						T								
F	Nais sp.														
	N. eliguis														
	Peloscolex freyi														
T	P. multisetosis longidentus														
T	P. multisetosis multisetosis														
F	Potamothrix moldaviensis													86	
F	P. vejdovskyi														
	Slavina appendiculata														
	Immature with capilliform chaetae	215	430	301	2322			516	602	129	301	43		172	172
	Immature without capilliform chaetae	817	1978	1118	4386	129		1548	2236	731	1548	473		688	344
	Pelecypoda (clams)														
T	Pisidium		43												
T	Sphaerium	43		86	86	43			86				43		
	Isopoda (sow bugs)														
T	Asellus militaris														
	Amphipoda (scuds)														
F	Gammarus														
	Ephemeroptera (mayflies)														
I	Hexagenia limbata														
	Trichoptera (caddisflies)														
I	Philopotamidae														
	Diptera (flies, midges)														
I	Ceratopogonidae	43													
	Chironomidae (true midges)														
F	pupae								86						43
T	Chironomus			258		43		43	86		43				43
F	Cryptochironomous				86			86		86				43	43
F	Cryptotendipes													43	43
T	Dicrotendipes		43	86									43		
T	Glyptotendipes	43													
F	Microtendipes									86					

Table ____ (Continued)

Station Number:	BL-8		BL-9		BL-10		BL-11		BL-12		BL-13		BL-14	
Depth (ft.):	20		20		20		20		10		10		10	
Substrate Type:	Sand Gravel		Silt		Silt		Silt		Sand		Silt		Silt Detritus	
Tolerance Sample:	A	B	A	B	A	B	A	B	A	B	A	B	A	B
F Phaenopsectra														
F Polypedilum			86	903					43					
T Procladius	129	43				817	817	1290	86		86		43	43
F Rheotanytarsus														
F Thienemannimyia														
Total number of species/ sample	6	8	8	6	2	7	7	4	5	5	9	5	9	1
Total number individuals/m^2	2150	3612	3956	8084	3784	3440	4687	3956	1548	1806	5375	3870	7095	5160
Combined samples-Total species/ stations	11		9		8		8		9		11		11	
Combined samples-Total individuals/ stations	5762		12040		7224		8643		3354		9245		12255	
% Oligochaete individuals/stations	87		90		82		74		95		99		99	
% Chironomid individuals/stations	4		9		17		26		5		1		1	
% Mayfly individuals/stations	0		0		0		0		0		0		0	
% Other individuals/stations	9		1		1		0		0		0		0	

** Oligochaetes lost

Table ____ (Continued)

	Station Number:	BL-15		BL-16		BL-17		BL-18		BL-19		BL-20		BL-21	
	Depth (ft.):	10		8		5		7		7		6		3	
	Substrate Type:	Silt		Silt		Silt		Silt		Silt Plant Remains		Silt Plant Remains**		Sand, Silt Plant Remains	
	Sample:	A	B	A	B	A	B	A	B	A	B	A	B	A	B
F	Phaenopsectra														
F	Polypedilum														86
T	Procladius	172	559	43	301				43	86	129				
F	Rheotanytarsus	43	43	43							43				43
F	Thienemannimyia							43			43	43	86	43	43
	Total number of species/ samples	8	7	6	6	4		7	6	6	7	4	4**	8	10
	Total number individuals/m^2	1548	3956	2150	8127	516		3655	3995	1892	2322	1161	301	1333	1247
	Combined samples-Total species/ stations	10		9		5		9		9		6		9	
	Combined samples-Total individuals/ stations	5504		10277		516		7650		4214		1462		2580	
	% Oligochaete individuals/stations	81		90		75		93		87		92		77	
	% Chironomid individuals/stations	16		8		8		5		12		3		18	
	% Mayfly individuals/stations	0		0		8		1		1		3		5	
	% Other individuals/stations	2		2		8		1		0		2		0	

** Oligochaetes lost

Table ____ (Continued)

	Station Number:	BL-1		BL-2		BL-3		BL-4		BL-5		BL-6		BL-7	
	Depth (ft.):	40		15		10		15		20		35		25	
	Substrate Type:	Gravel Sand		Silt Sand		Sand Silt Gravel		Silt		Cinders Coal Sand		Silt		Silt	
Tolerance	Sample:	A	B	A	B	A	B	A	B	A	B	A	B	A	B
F	Phaenopsectra	43													
F	Polypedilum		86			43									
T	Procladius			688	344	301	129	43	301		43	602	43	1247	43
F	Rheotanytarsus														
F	Thienemannimyia														
	Total number of species/ sample	5	4	6	6	9	10	3	6	3	6	7	3	6	6
	Total number individuals/m^2	559	473	8041	2752	5031	4343	817	3698	2967	2451	12986	473	11610	774
	Combined samples-Total species/ stations	8		8		13		6		6		9		7	
	Combined samples-Total individuals/ stations	1032		10793		9374		4515		5418		13459		12384	
	% Oligochaete individuals/stations	54		89		89		89		97		92		85	
	% Chironomid individuals/stations	17		10		5		8		2		7		12	
	% Mayfly individuals/stations	0		0		0		0		0		0		0	
	% Other individuals/stations	29		1		5		3		1		1		3	

** Oligochaetes lost

APPENDIX C

Correspondence in the Course of Preparing the Environmental Impact Statement

DRAFT ENVIRONMENTAL IMPACT STATEMENT

COMMENT LETTERS

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE Room 101, 1405 South Harrison Road
East Lansing, Michigan 48823

November 21, 1977

U.S. Army Engineer District, Detroit
ATTN: Chief, Environmental Resources Branch
P.O. Box 1027
Detroit, Michigan 48231

Gentlemen:

We have reviewed the draft environmental statement and letter report for the Confined Disposal Facilities, Dredging, Structure, Repairs and Operations, Frankfort Harbor, Michigan, and have the following comments to make:

The Soil Conservation Service in cooperation with the City of Frankfort and the Michigan Department of Natural Resources, Waterways Division, has a Resource Conservation and Development measure currently under construction. This measure is designed to stabilize the eroding bank of Lake Betsie in the city marina between Fifth and Seventh Streets. This is adjacent to proposed disposal site #4. The dredging project should be carried out in such a manner so as not to cause additional erosion hazards or endanger the erosion control measures currently being installed.

If site #4 is used for disposal, the containing dike should be installed in such a manner as to be compatible with the erosion control measures being installed.

We appreciate the opportunity to review and comment on the proposed project.

Sincerely,

Arthur H. Cratty
State Conservationist

cc: Coordinator, Environmental Quality Activities, USDA, Washington, D.C.
R. M. Davis, Administrator, SCS, Washington, D.C.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NORTHEASTERN AREA, STATE AND PRIVATE FORESTRY
6816 MARKET STREET, UPPER DARBY, PA. 19082
(215) 596-1671

8430
November 28, 1977

Mr. P. McCallister
Chief, Engineering Division
U.S. Army Engineer District, Detroit
ATTN: Chief, Environmental Resources Branch
P.O. Box 1027
Detroit, Michigan 48231

Refer to: NCEED-ER, Draft Environmental Statement, Confined Disposal Facilities, Frankfort Harbor, MI

Dear Mr. McCallister:

We believe that some planting program should be applied to Site 5A if it is used, even if it is not used as a landscaped park like Site 4.

Thank you for the opportunity to review this draft statement.

Sincerely,

DALE O. VANDENBURG
Staff Director
Environmental Quality Evaluation

FEDERAL ENERGY REGULATORY COMMISSION
Federal Building - Room 3130
230 South Dearborn Street
Chicago, Illinois 60604

November 1, 1977

U.S. Army Engineer District, Detroit
Attn: Chief, Environmental Resources Branch
P.O. Box 1027
Detroit, Michigan 48231

Gentlemen:

We have reviewed the Draft Environmental Impact Statement dated September 1977 for Confined Disposal Facilities, Dredging, Structure Repairs and Maintenance Operations, Frankfort Harbor, Michigan.

Comments of this office are made in accordance with the National Environmental Policy Act of 1969 and the August 1, 1973 Guidelines of the Council on Environmental Quality. Our principal concern with this development is its effect on bulk electric power facilities including potential hydroelectric developments and on natural gas pipeline facilities.

Since the above noted proposed project apparently would pose no major obstacle to the construction of such facilities, we have no comments on the Draft EIS.

The statements are of this office and do not necessarily represent the views of the Federal Energy Regulatory Commission.

Very truly yours,

Bernard D. Murphy

Bernard D. Murphy
Regional Engineer

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

Mr. P. McCallister
Chief, Egnineering Division
U.S. Army Corps of Engineers, Detroit
P. O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

We have completed our review of the Draft Environmental Impact Statement (EIS) for the proposed confined disposal facility, dredging, structure repairs and operations at Frankfort Harbor, Michigan which was sent to us with your letter of October 20, 1977. Based on information presented in the EIS and our September 27, 1977, visit to the site of the proposed confined disposal facilities, we have no major objections to the proposed activities, but request additional information for a complete assessment. We offer the following comments for your use in preparing the Final EIS.

Our Agency finds use of sites 4 (the Bureau of Outdoor Recreation property), 5a (Luedtke property), and 9 (the Fife Lake State Forest) acceptable for dredged sediment disposal at Frankfort Harbor. But it should be noted that the sediment analysis for Frankfort Harbor indicated that sediments contain high levels of lead and zinc. Consequently, measures to mitigate water quality impacts and monitoring procedures should be designed to adequately protect against contamination by those pollutants.

If lead and zinc remain attached to the fines in the sediment, the sand filter at Site 4 should be adequate; however, if the pollutants are converted to salts, they may be released with the CDF effluent and a clay liner may be required along with appropriate remedial measures to achieve water quality standards. The Final EIS should address potential chemical reactions which could occur during dredging and disposal operations and which may allow lead and zinc to be converted to salts. We request the opportunity to review the monitoring procedures that will be used at Frankfort and recommend that a series of pipes be incorporated into the dike design at Site 5a to accomplish testing of the effluent. It should be indicated in the Final EIS who will assume responsibility for monitoring the confined disposal facility effluent and what parameters will be tested and how frequently. We recommend the following monitoring procedures:

The following parameters are basic and easy to run in the field. They can be used to control the sampling program and detect changes immediately: temperature, specific conductivity, pH and turbidity. Suspended solids should be run to determine the efficiency of the sedimentation process in the disposal area. Ammonia should be run because it can be toxic, a nutrient and is the compound most likely to leach from the spoil in easily detectable quantities. Chlorides and sulfites should be run because they are soluble, conservative and can be used as tracers for the plume.

Additional parameters should be selected based on the results of the bulk sediment or elutriate analysis of the original spoil. If bulk sediment concentrations exceed the following values, the parameter should be run:

TKN	2000 mg/kg	Manganese	500 mg/kg
Phosphorus	650 mg/kg	Arsenic	8 mg/kg
Lead	60 mg/kg	Cadmium	6 mg/kg
Zinc	200 mg/kg	Chromium	75 mg/kg
Cyanide	0.25 mg/kg	Barium	60 mg/kg
Iron	25,000 mg/kg	Copper	50 mg/kg
Nickel	50 mg/kg		

Or if elutriate test results exceed the following values, the parameter should be included:

Cyanide	0.01 mg/l	Lead	5 ug/l
Phenol	50 ug/l	Zinc	25 ug/l
Arsenic	5 ug/l	Hg	0.5 ug/l
Cadmium	1.0 ug/l	TKN	5 mg/l
Copper	10 ug/l	Phosphorus	.05 mg/l
Iron	500 ug/l		
Manganese	500 ug/l		

The bulk sediment values are based on over 250 samples from Great Lakes harbors collected during 1974 and 1975. The elutriate values are based on 48 samples collected during 1975.

Parameters which are consistently below the level of detectability in the first 5 samples may be discontinued.

BIOLOGY

Macroinvertebrate samples should be collected in the receiving waters before the discharge starts and again near the end or immediately after the discharge ceases. This will detect and document any effects that the discharge may have had on the benthic community of the receiving waters.

In addition, vegetation produced at the Fife Lake State Park property should be monitored for intake of pollutants. As previously conveyed to your staff, U.S. EPA's publication on "Application of Sewage Sludge to Cropland: Appraisal of Potential Hazards of the Heavy Metals to Plants and Animals" should be helpful in determining the best condition for disposal at the State Forest. The potential for smothering existing tree roots by placement of spoil and erosion of the sediment should be addressed in the Final EIS. Planting should be planned as soon as possible to mitigate sediment erosion.

At the time of our site visit at Frankfort Harbor, it was not certain whether the railroad car ferry service was going to continue. The current status of the ferry service should be included in the Final EIS.

The old sediment guidelines used by U.S. EPA should be eliminated from the document (page 1-17) or their proper historical perspective explained. The new sediment guidelines now used by U.S. EPA should be presented in full including page 1 (copy attached).

The U.S. EPA should be included as a member of the Site Selection Committee referenced on page 42.

As indicated in the above discussion and in accordance with EPA's procedures, we have classified our comments on the proposed CDF and maintenance operations as LO, lack of objection, and rated the Draft EIS as Category 2, additional information required. The date and classification of our comments will be published in the Federal Register.

Thank you for the opportunity to review the subject document. If you have any questions about our comments, please contact Ms. Barbara Taylor of my staff at 312/353-2307. Please send us two copies of the Final EIS when it is filed with the Environmental Protection Agency in Washington, D.C.

Sincerely,

Susan P. Walker, Chief
Environmental Impact Review Staff
Office of Federal Activities

Attachment

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230
(202) 377-3111

December 13, 1977

Mr. P. McCallister
Chief, Engineering Division
Department of the Army
Detroit District, Corps of Engineers
Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

This is in reference to your draft environmental impact statement entitled, "Confined Disposal Facilities, Dredging, Structure, Repairs and Operations Frankfort Harbor, Michigan." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving eight (8) copies of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosures - Memo from National Ocean Survey,
November 15, 1977
Memo from Great Lakes Environmental Research
Laboratory, November 14, 1977

CZM?

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SURVEY
Rockville, Md. 20852

C52/JLR

NOV 15 1977

TO: William Aron
Director
Office of Ecology and Environmental Conservation

FROM: Gordon Lill
Deputy Director
National Ocean Survey

SUBJECT: DEIS #7710.27 - Confined Disposal Facilities, Dredging, Structure, Repairs and Operations Frankfort Harbor, Michigan

The subject statement has been reviewed within the areas of NOS responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

The following comments are offered for your consideration.

On page 2-7, paragraph 2.26, the recent high level should read 581.04 feet, vice 581. The recent low level should read 575.35 feet, vice 575.38. The dates cited are correct. Also, page 16, first paragraph, change 2.23 feet to 2.21 feet.

Geodetic control survey monuments may be located in the proposed project area. If there is any planned activity which will disturb or destroy these monuments, NOS requires not less than 90 days' notification in advance of such activity in order to plan for their relocation. NOS recommends that funding for this project includes the cost of any relocation required for NOS monuments.

CZM2

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
ENVIRONMENTAL RESEARCH LABORATORIES

Great Lakes Environmental Research Laboratory
2300 Washtenaw Avenue
Ann Arbor, Michigan 48104

November 14, 1977

TO: Director
Office of Ecology and Enviornmental Conservation, EE

FROM: Eugene J. Aubert
Director, GLERL, RF24

SUBJECT: DEIS 7710.27 - Confined Disposal Facilities, Dredging, Structure Repairs, and Operations, Frakfort Harbor, Michigan

The subject DEIS prpeared by the Corps of Engineers, Detroit District, on maintenance dredging in Frankfort Harbor, Lake Michigan, and disposal of polluted spoil has been reviewed and comments herewith submitted.

Maintenance dredging of Frankfort Harbor and maintenance of the harbor structures will, in our opinion, produce no long-term impacts on Lake Michigan. Either one of the two selected sites on the shore of Betsie Lake for the interim disposal of polluted spoil and the ultimate disposal of that spoil in the State forest is acceptable.

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
2510 DEMPSTER STREET
DES PLAINES, ILLINOIS 60016

ER-77/974

December 5, 1977

Colonel Melvyn D. Remus
District Engineer
U.S. Army Engineer District
P.O. Box 1027
Detroit, Michigan 48231

Dear Colonel Remus:

The Department of the Interior has reviewed the Draft Environmental Statement and Letter Report of Operation and Maintenance for Frankfort Harbor, Benzie County, Michigan as requested in your transmittal letter of October 20, 1977. The following specific comments concern the draft environmental statement.

We have determined that the use of site 4 for the construction of a four-acre confinement facility could constitute a conflict with Section 6(f) of the Land and Water Conservation Fund Act of 1965. As proposed, the site 4 facility would be located entirely within an area (totaling approximately 6.5 acres in size) that has been approved for acquisition with assistance from the Land and Water Conservation Fund to expand the Mineral Springs Park and Marina (Projects 26 - 00741 and 26 - 00893). These projects were approved by the Lake Central Region, Bureau of Outdoor Recreation, on July 16, 1976, and February 11, 1977, respectively.

If site 4 is unavailable, the draft statement mentions that site 5A will be used as a temporary confinement facility. This site would be situated adjacent to the 10th Street Boat Launching Park, which was developed with assistance from the Land and Water Conservation Fund (Project 26 - 00126). Therefore, any permanent or temporary taking of land from the park during construction of the proposed earthen access road from the existing 10th Street right-of-way to site 5A would conflict with Section 6(f) of the Land and Water Conservation Fund Act of 1965. As amended, Section 6(f) reads:

> No property acquired or developed with assistance under this section shall, without the approval of the Secretary, be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonable equivalent usefulness and location.

We request that the Army Corps of Engineers coordinate the above matters with Mr. O. J. Scherschligt, Deputy Director, Michigan Department of Natural Resources, Box 30028, Lansing, Michigan 48909.

4.D. Water Quality - Bottom sediments in the project area have been classified as unsuitable for open-water disposal owing to excessive quantities of volatile solids, COD, phenol, nitrogen, phosphorus, and oil and grease, plus excessive levels of lead and zinc (page 31, paragraph 4.12). In order to reduce any adverse effects on water quality within the harbor that may result from dredging operations, measures such as silt screens should be used to locally control the migration of the turbidity plume which may contain hazardous concentrations of polluted materials.

6.B. Alternative Diked Disposal Sites - In Section 6.07 (page 43), the draft statement mentions that site 4 is owned by the Bureau of Outdoor Recreation (BOR). This statement is incorrect and should be replaced with one indicating that the BOR has approved Land and Water Conservation Fund projects for the acquisition of this area by the City of Frankfort to expand Mineral Springs Park and Marina.

9.B. Government Agencies - We note on page 46 that the State Historic Preservation Officer (SHPO) was contacted for information during the preparation of the draft statement, but no indication of the results of this consultation has been provided. The environmental impact statement should include documentation of consultation with the SHPO and contain a copy of her comments on the proposed action.

To comply with the policy set forth in Section 1(3) of Executive Order 11593, all areas to be affected by the proposed project --including all proposed disposal areas and any borrow areas to be used for construction materials--should be professionally examined for archeological remains. Any archeological sites identified should then be evaluated with reference to the criteria for listing on the National Register of Historic Places (36 CFR 800.10).

Sincerely yours,

David L. Jervis
Regional Environmental Officer

cc: Michigan Department of Natural Resources,
Attn: O. J. Scherschligt

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION 5
18209 DIXIE HIGHWAY
HOMEWOOD, ILLINOIS 60430

November 8, 1977

IN REPLY REFER TO
HED-05

U.S. Army Engineer District, Detroit
P. O. Box 1027
Detroit, Michigan 48231

ATTN: Chief, Environmental Resources Branch

Gentlemen:

The draft environmental statement for the dredging, structure repairs and operations, Frankfort Harbor, Michigan, has been reviewed.

In the summary of adverse effects and other parts of the statement, it is noted that increases in dust and noise due to construction as well as increases in traffic congestion are expected. Truck access routes will need to be constructed at Site 4 as well as improved from M-115 to the Fife Lake State Forest disposal site. Interim handling, dewatering and truck hauling are proposed and a railroad crossing is affected. The effects of truck traffic on the State and local roads and hauling within the business district are discussed. These effects are considered unavoidable and short-term. We believe some mitigation of these adverse effects should be considered since they are significant and especially since they will affect traffic in the business district. We, therefore, recommend the State and/or local road agencies be consulted and the statement address the mitigation measures which can be implemented to minimize the adverse impacts to traffic congestion, noise and dirt due to construction operation in this area.

It is also recommended the statement address the impacts associated with disposal Site 9 such as anticipated odors, the effects of truck hauling and the extent of improving and maintaining the small access road in the forest area. The condition of this road and the nature of the improvement including its environmental effects as well as the responsibilities for maintenance should be considered.

Sincerely yours,

Donald E. Trull
Regional Administrator

By: Jerry F. Poston
FOR W. G. Emrich, Director
Office of Environment and Design

DEPARTMENT OF TRANSPORTATION
SAINT LAWRENCE SEAWAY DEVELOPMENT CORPORATION
WASHINGTON, D.C. 20590 MASSENA, NEW YORK 13662

November 16, 1977

Mr. P. McCallister
Chief, Engineering Division
Army Engineers, Detroit District
P. O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

Reference is made to NCEED-ER 20 October 1977 transmittal of the Draft EIS's for maintenance dredging of the following harbors and waterways:

Les Cheneaux Islands, Michigan
St. Joseph Harbor, Michigan
Frankfort Harbor, Michigan
Port Austin Harbor, Michigan

SLSDC has reviewed the subject EIS's and has no comments to offer. Thank you for the opportunity to examine these documents.

Sincerely,

Clarke F. Dilks
Chief, Environmental Planning

NATURAL RESOURCES COMMISSION
CARL T. JOHNSON
E. M. LAITALA
DEAN PRIDGEON
HILARY F. SNELL
HARRY H. WHITELEY
JOAN L. WOLFE
CHARLES G. YOUNGLOVE

STATE OF MICHIGAN
WILLIAM G. MILLIKEN, Governor
DEPARTMENT OF NATURAL RESOURCES
STEVENS T. MASON BUILDING, BOX 30028, LANSING, MICHIGAN 48909
HOWARD A. TANNER, Director

January 9, 1978

Mr. P. McCallister
Chief, Engineering Division
U.S. Army Engineer District, Detroit
ATTN: Chief, Environmental Resources Branch
P. O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

Thank you for the opportunity to review your Draft Environmental Statement on the Confined Disposal Facilities, Dredging, Structure, Repairs and Operations, Frankfort Harbor, Michigan and the Letter Report.

The Department has reviewed these reports and have found them satisfactory in dealing with the environmental concerns of this project. We have no additional comments at this time.

Sincerely,

Howard A. Tanner

Howard A. Tanner
Director

cc: O. J. Scherschligt

MICHIGAN
THE GREAT LAKE STATE

R1026 10/76

MICHIGAN DEPARTMENT OF STATE
RICHARD H. AUSTIN SECRETARY OF STATE

LANSING
MICHIGAN 48918

MICHIGAN HISTORY DIVISION
ADMINISTRATION, ARCHIVES, HISTORIC SITES, AND PUBLICATIONS
3423 N. Logan Street
517-373-0510
STATE MUSEUM
505 N. Washington Avenue
517-373-0515

October 25, 1977

District Engineer
U.S. Army Corps of Engineers, Detroit District
P.O. Box 1027
Detroit, Michigan 48231
Attn: Environmental Resources Branch

Dear Sir:

Our staff has reviewed the following project and concludes that it will have no effect on cultural resources.

Confined Disposal Facilities, Dredging, Structure, Repairs and Operations, Frankfort Harbor

If you have further questions, please contact Dr. Lawrence Finfer, Environmental Review Coordinator for the Michigan History Division. Thank you for giving us the opportunity to comment.

Sincerely yours,

Martha M. Bigelow
Director, Michigan History Division
and
State Historic Preservation Officer

MMB/LF/cw

GENERAL CORRESPONDENCE

United States Department of the Interior

IN REPLY REFER TO:

FISH AND WILDLIFE SERVICE
EAST LANSING FIELD OFFICE (ES)
Room 301, Manly Miles Building
1405 S. Harrison Road
East Lansing, Michigan 48823

October 3, 1979

Colonel Robert V. Vermillion
U.S. Army Engineer
Detroit District
P.O. Box 1027
Detroit, Michigan 48231

Dear Colonel Vermillion:

We have reviewed the proposed alternative disposal locations for the maintenance dredging project at Frankfort Harbor, Benzie County, Michigan. The following comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401 as amended; 16 U.S.C. 661 et seq.), and in compliance with the intent of the National Environmental Policy Act of 1969.

We have no objection to the use of site 4, site 5, or site 5A as interim upland sites, with the excess dredge materials trucked to the Betsie River State Forest (site 9).

In preparing the interim site, the lakeward most extension of the bulkhead should not exceed 10 feet from the existing shoreline.

Sincerely yours,

Clyde R. Odin
Supervisor

Les Cheneaux, Cedarville, Michigan:

Expand Future Boat Launch - We are not opposed to the expansion by 1/2 acre of the proposed boat launch area providing certain coordinated steps are taken to ensure minimal impacts on boater and fishermen use of the launch. Such disposal actually would limit the impact to one specific site and project for the Cedarville area.

Golf Course Site - As stated in the minutes, we are opposed to the use of this site. The two-acre interim site is located in a wetland consisting of reed canary grass. Other non-wetland type habitat should be used for temporary storage sites. Dredge materials possibly could be placed on the parking lot or portions thereof, adjacent to the Golf Course during the off season. Portions of the Golf Course Site above the reed canary grass marsh are uplands, and possibly materials could be piped along the driveway to that site. Docks at the end of the parking lot probably could be removed and the area used as a mooring area for piping or offloading.

Sincerely yours,

Raymond L. McCann

Acting Assistant Regional Director
Environment

cc: Michigan Dept. of Natural Resources

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

DEC 10 1976

Colonel Melvin D. Remus
District Engineer
Detroit District, Corps of Engineers
Box 1027
Detroit, Michigan 48231

Dear Colonel Remus:

Reference is made to an August 2, 1976, request by the Michigan Department of Natural Resources for a determination of the eligibility for waiver of the 25 percent non-federal contribution for the contained dredge spoil disposal program at Frankfort, Michigan.

Section 123(d) of Public Law 91-611 gives the authority to the Secretary of the Army to waive the required local cooperation when the U.S. Environmental Protection Agency finds that certain requirements are being met. The two requirements that must be fulfilled are:

1. Local entities must be participating in and in compliance with an approved plan for the general geographical area of the dredging activity for construction, modification, expansion, or rehabilitation of waste treatment facilities.

2. Applicable water quality standards are not being violated.

Since both requirements have been satisfied, we find that the local sponsor is eligible for the waiver of the 25 percent non-federal contribution towards construction costs of the dredge spoil disposal program for Frankfort Harbor.

If we can be of further assistance, please do not hesitate to contact this office.

Sincerely yours,

Valdas V. Adamkus
Deputy Regional Administrator

27 DEC 976

NCEED-T

Dr. Howard A. Tanner
Director, Dept. of Natural Resources
Stevens T. Mason Building
Lansing, MI 48926

Dear Dr. Tanner:

This concerns your 2 August 1976 request to the United States Environmental Protection Agency for a waiver of the 25 percent non-Federal contribution for the contained dredge spoil disposal program at Frankfort, Michigan.

Paragraph (c) of Section 123 of the River and Harbor Act of 1970 (Public Law 91-611) requires the appropriate state or states, interstate agency, municipality, or other appropriate political subdivision of the state to agree to contribute to the United States 25 percent of the construction costs prior to construction of a contained disposal facility. The Environmental Protection Agency has found that Frankfort is participating in and in compliance with an approved plan for the geographical area of the dredging activity for construction, modification, expansion or rehabilitation of waste treatment facilities and applicable water quality standards are not being violated. Consequently, the Environmental Protection Agency has found Frankfort eligible for a waiver from contribution to construction costs.

This is to inform you that I have reviewed the findings of the Environmental Protection Agency in this matter. By the provisions of paragraph (d), Public Law 91-611, under the authority of the Secretary

NCEED-T
Dr. Howard A. Tanner

7 DEC 1976

of the Army, I do hereby grant a waiver of the obligation of non-Federal interests to contribute 25 percent of the construction costs of the proposed spoil disposal facility to be located at Frankfort, Michigan.

Sincerely yours,

MELVIN D. REMUS
Colonel, Corps of Engineers
District Engineer

Copy Furnished:
Mr. Dale Granger, Chief, Hydrological Division

Tech. Br. (Jones)

Inland Route

We concur with the use of the Site Nos. 1 and 2 as interim storage areas and Nos. 5 and 6 for final deposition of dredged material.

Harbor Beach

We concur with the use of the City-owned property at Site No. 1 as an interim drying area and final deposition at the county-owned gravel pit (Site No. 3) at Harbor Beach.

St. Joseph

We concur that Site 7 (Mallable) and Site 8 (ships canal) are acceptable for spoil disposal at St. Joseph Harbor. We conducted a field investigation of Site 10 on March 9, 1977, and found it to be acceptable as well.

Port Austin

Our November 1, 1976, letter to your office indicated that we preferred the village lagoon site (Site E) for confined disposal at Port Austin. We understand from the Site Selection Committee meeting that this upland site is no longer available for spoil disposal. Since there are no apparent environmental problems with the island site (Site C), we will concur with a decision to proceed with its design. More specific information on the facility's affects on littoral processes, harbor water quality, etc. should be included in subsequent assessments.

Sebewaing

We understand that the development of Site A-1 at Sebewaing and its ultimate use as an airport runway extension has the support of the local community. We also note your proposal to replace the 7 to 8 acres of wetlands that would be lost with construction of Site A-1 with an equivalent area in deeper water and adjacent to the navigation channel. However, considering the value of existing wetlands at Site A-1, our Agency finds construction of a confined facility there unacceptable until all feasible alternatives to wetland destruction have been thoroughly evaluated.

We commend your efforts to derive public benefit in developing a dike disposal area for polluted materials and your offer to mitigate wetland loss. We believe your proposal to replace wetlands presents an excellent method of compensation for projects which have already adversely impacted wetlands, as well as for future projects for which there is no other alternatives that would avoid wetland impacts. We would be pleased to see such a research effort undertaken. But we do not believe such mitigation is appropriate in a situation where the initial destruction of wetlands can be avoided.

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

MAR 11 1977

Mr. Bernard Malamud
Acting Chief
Engineering Division
Detroit District, Corps of Engineers
Box 1027
Detroit, Michigan 48231

Dear Mr. Malamud:

Reference is made to your letter of February 1, 1977, concerning E.P.A.'s position on alternate dredge material disposal sites at Frankfort, Les Cheneaux, Inland Route, Harbor Beach, St. Joseph, Port Austin, and Sebewaing, Michigan as discussed by the Site Selection Committee at their January 20, 1977 meeting. We trust the following information will clarify our position on each project proposed for the above harbors.

Frankfort

The Committee discussed two feasible alternatives for dredge material disposal at Frankfort: to fill the Bureau of Outdoor Recreation (BOR) Site No. 4 and truck excess material to the State forest property or use the Luedtke property, Site No. 5 as an interim holding area and truck all the material to the State forest property. Another alternative discussed involved using the Luedtke and State forest property for the backlog material until the BOR site is available. We do not anticipate any significant adverse impacts with any of the above sites and concur with developing sites 4 and 5 as interim sites and the State forest as the ultimate site.

Les Cheneaux

We have attended a meeting subsequent to the Site Selection Committee Meeting on spoil disposal at Les Cheneaux at State Senator Davis's office in Lansing. Due to objections expressed by the Michigan Department of Natural Resources, U.S. Fish and Wildlife Service and our Agency with regard to the wetland area involved, we understand that Site No. 4 (adjacent to the Taylor Lumber Company) is no longer under consideration. Based on our preliminary review, we would concur with development of either Sites 2a and/or 2b with final deposition at the Township dump. The final assessment of Sites No. 2a and 2b should include impacts associated with trucking the spoil i.e., adequacy of local roads to accomodate trucks, spoil slippage from trucks, noise impacts etc.

It was agreed upon conclusion of the Site Selection Committee Meeting that the Corps would prepare an expanded Environmental Assessment for the Sebewaing project which would be distributed to all Committee members for their review and comment. We believe the following information should be included in the expanded assessment to evaluate both the potential and the impacts of the proposed airport runway extension and flood protection associated with development of Site A-1.

1. The feasibility as well as a need of runway extension should be thoroughly addressed. It should be determined if airport officials have initiated any steps to extend the airport runway; these steps should be explained. Would runway extension be solely a local project or would there be State or Federal monetary or licensing involvement. The probability of such Federal or State approval should be investigated. It should be determined if the project would result in any change in the number of operations or type of aircraft at the airport.

2. The details of flood protection potential with development of Site A-1 should be thoroughly addressed. The degree of past flooding and costs of damages incurred should be determined. Alternative flood protection methods (both structural and non-structural) for areas impacted should be compared with regard to effectiveness, environmental effects, costs, and benefits.

3. The feasibility of marsh construction should be discussed with specific regard to the type of fresh water habitat typical to the study area. The quality of the existing marsh should be determined and compared to that which would be constructed. Some attempt should be made to quantify comparable wetlands in the study area. If possible, a comparison should be made regarding the acreage of comparable wetland which has already been lost to development in the study area. Finally, the timing of wetland construction should be discussed, i.e., would development of Site A-1 be implemented after (or before) marsh construction?

4. The feasibility of alternatives to construction in the wetlands should be thoroughly evaluated. The potential use of dredge spoil as a beneficial resource e.g., as construction material, land fill, and/or agricultural cover should be addressed. Impacts with regard to transporting dredge material should be included.

Please note that our comments on each of the above projects are preliminary at this time and that our final position will be determined after our review of the Draft Environmental Impact Statement on each project. If you have any questions regarding our comments, please contact Ms. Barbara J. Taylor of my staff at 312-353-2307.

Sincerely yours,

Barbara Jean Taylor for

Gary A. Williams
Chief,
Environmental Review Section

STATE OF MICHIGAN

NATURAL RESOURCES COMMISSION
CARL T. JOHNSON
E. M. LAITALA
DEAN PRIDGEON
HILARY F. SNELL
HARRY H. WHITELEY
JOAN L. WOLFE
CHARLES G. YOUNGLOVE

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, BOX 30028, LANSING, MICHIGAN 48909
HOWARD A. TANNER, Director

CZM 7.

May 13, 1977

Mr. Philip A. McCallister, Chief
Engineering Division
U. S. Corps of Engineers
P. O. Box 1027
Detroit, Michigan 48231

Attn: Richard Kavalar

Dear Mr. McCallister:

Reference is made to your February 1 letter concerning dredged material disposal sites at Frankfort, Les Cheneaux, Inland Route, Harbor Beach, St. Joseph, Port Austin, and Sebewaing. The Department Dredge Spoil Committee wishes to reaffirm its earlier positions concerning these site needs as reviewed in several meetings with your staff earlier.

1) Frankfort: The Department favors filling of the BOR site and trucking excess material to State Forest properties. The Committee's second consideration for Frankfort would utilize designated Luedke properties as an interim holding area with trucking of all dewatered materials to State Forest properties.

2) Les Cheneaux: The Department Committee recommends permanent containment at the township dump with utilization of an interim handling site at the golf course site or lacking that capability then development of an off-loading site at the Department boat launching facility which will be constructed as part of a project at Cedarville.

3) Inland Route: The Department favors an off-loading facility at the end of Snyder Road with final containment on the east side of Snyder Road just south of Brutus Road on State Forest properties.

4) Harbor Beach: The Committee strongly favors the utilization of city owned property at the northern city limits as an interim handling site with trucking of material to the county owned gravel pit.

5) St. Joseph: Committee favors utilization of the Whirlpool Corporation properties as an interim handling site with final disposal at Site 7 by truck delivery on a parcel of property which has been used as an industrial dump. We understand it has not been acquired by the local government.

MICHIGAN

M1028 10/76

6) Port Austin: The Committee favors construction of a near shore island facility east of the present recreational watercraft harbor facilities with a causeway connection to permit public use of this island for recreational purposes on completion.

7) Sebewaing: The Department Committee favors utilization of the land at the northern terminus of the present village airport with construction of a 30-acre littoral marsh replacement project as mitigation for the losses attendant with the airport site.

If you have further questions on these views, please feel free to contact us.

Very truly yours,

BUREAU OF LAND & WATER MANAGEMENT

Dale W. Granger, P.E., Chief
Water Management Division

DWG:cjs

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

MAY 27 1977

Mr. P. McCallister
Chief, Engineering Division
Department of the Army
Detroit District, Corps of Engineers
Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

Reference is made to your letter of April 15, 1977, concerning confinement of polluted dredge material at Frankfort Harbor, Michigan. You specifically inquired about our opinion with regard to a new interim handling site - Site #5A - adjacent to the Luedtke property (Site #5). It appears from the maps you provided and from notes from our previous site visit of the project area that Site 5A and Site 5 are similar and, therefore, we believe Site 5A would also be acceptable.

Sincerely yours,

Ronald L. Mustard

Ronald L. Mustard
Acting Chief
Environmental Review Section

WILLIAMS & WORKS
ENGINEERS / SURVEYORS / PLANNERS / GEOLOGISTS
611 CASCADE WEST PARKWAY, S.E. GRAND RAPIDS, MICHIGAN 49506
TELEPHONE (616) 942-9000

August 9, 1977

Dr. Martha Bigelow
State Historic Preservation Officer
Michigan History Division
Department of State
Lansing, MI 48923

Dear Dr. Bigelow:

We are preparing an Environmental Impact Statement ahead of confined disposal of dredged materials which are unsuitable for release into open water in the area of Frankfort Harbor, Benzie County, Michigan.

You have already responded to our question concerning known and potential archaeological and historical values in the area of proposed confined disposal sites around Betsie Lake.

Enclosed are maps related to an upland site in the Fife Lake State Forest, Sections 29 and 30 of Township 25 North, Range 14 West, in Benzie County. These maps are copied from the U. S. G. S. 15 minute Frankfort Quadrangle, and a land use map of larger scale. Please evaluate the areas marked in red, sites 1 through 3, for their known or potential archaeological or historical values. Please return your comments to us at an early date since we are well into the draft Environmental Statement.

If I might be of further help in your review, please give me a call.

Yours very truly,

WILLIAMS & WORKS, INC.

Jeffrey C. Sutherland

Jeffrey C. Sutherland, Ph.D.,P.E.,
Certified Professional Geologist, APGS

enclosure

JCS/be

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231

NCEED-T

05 JAN 1978

PUBLIC NOTICE

DIKED DREDGE DISPOSAL AREA, FRANKFORT, MICHIGAN

1. The existing Federal Navigation Project at Frankfort Harbor was authorized by the River and Harbor Act of 1886, and modified under the provision of Section 107 of the River and Harbor Act of 1960. Section 123 of the River and Harbor Act of 1970 (Public Law 91-611) has authorized the construction, operation and maintenance of diked disposal and storage areas for the containment of dredged materials unsuitable for open lake disposal for a period not to exceed ten (10) years. See inclosure #1 for the locations of the proposed confinement facility.

2. The initial project study outputs include a Letter Report and a Draft Environmental Impact Statement (DEIS) dated September 1977, which are being reviewed under the following laws:

Federal Water Pollution Control Act
Coastal Zone Management Act of 1972
National Environmental Policy Act of 1969
Fish and Wildlife Act of 1956
Fish and Wildlife Coordination Act
Endangered Species Act of 1973
National Historic Preservation Act of 1966

3. The proposed disposal site (Site 4) is located on the north shore of Lake Betsie between Seventh and Ninth Street in the City of Frankfort. See inclosure #2. An alternate site (Site 5A) is located on the north shore of Lake Betsie between Tenth and Eleventh Street in the City of Frankfort. See inclosure #3. Either of these sites would be used in conjunction with State Forest property located approximately 15 miles inland at Fife Lake State Forest. The first choice would be to use Site 4 as a permanent site with a storage capacity of 34,000 cubic yards. The excess material (approximately 66,000 cubic yards) would be trucked from Site 4 to the Fife Lake State Forest for ultimate disposal. If Site 4 is not used, a second alternative would be to use Site 5A.

Site 5A would be used as an interim handling site with no permanent storage capacity. Sediments would be temporarily stored at Site 5A (2-3 weeks) while awaiting transfer to trucks which would haul the entire 100,000 cubic yards to the Fife Lake State Forest. These two sites have not been previously designated by the EPA as disposal sites, but use of these sites has been supported by the EPA pending review of the Environmental Impact Statement.

4. Site 4 would encompass an area approximately four acres in size immediately south of Main Street between Seventh and Ninth Street on the Lake Betsie shoreline. The confinement facility would require earthen dikes on the east and west side 260 and 140 feet in length, respectively. These side dikes would have an effective height of approximately 5 feet above the existing shoreline and slope up to existing grade at Main Street. The south side of the site, adjacent to Lake Betsie, would be enclosed with approximately 800 linear feet of earthen dike protected on the lake side by stone and 200 feet of steel sheet pile vertical wall backfilled with granular fill. The steel sheet pile would serve as a mooring area and would allow a land based crane to unload moored scows with a relatively short working radius. The dike crest would be approximately 8 feet above Low Water Datum (approximately five feet above the shoreline in July of 1977), 10 feet wide at the top and have side slopes of 2 horizontal to 1 vertical. The top of the dike adjacent to the mooring area would be 24 feet wide to provide adequate working area. Approximately 9000 square feet of riprap armor and 7,000 square feet of steel sheet piling would be placed on the south face of the confinement facility. This riprap would serve to protect the disposal area from wave action. The effluent from the diked disposal area would be released to Lake Betsie through an oil skimmer and weir system.

5. Site 5A would serve as an interim site located on the northeast shore of Lake Betsie. The temporary confinement facility would be approximately 200 feet by 380 feet paralleling the existing shoreline. The facility would require earthen dikes with a crest four feet above the existing grade, four feet wide at the top, and having side slopes of 2 horizontal to 1 vertical. The lakeside dike would be located approximately 20 feet from the existing shoreline. The existing shoreline would require slope stabilization with approximately 150 linear feet of steel sheet pile and 200 linear feet of stone riprap. Approximately 4000 square feet of riprap and 5000 square feet of steel sheet piling would be placed on the

southern face of the shoreline at Site 5A for bank stabilization. Drainage from within the diked area would be released through a 20 foot long section of the dike which would be equipped with a fabric filter and graded stone to trap sediment.

6. The Letter Report and the Environmental Impact Statement for Frankfort are being coordinated with the following agencies:

a. Federal:

(1) Advisory Council on Historic Preservation

(2) U.S. Department of the Interior

(3) U.S. Environmental Protection Agency

(4) U.S. Department of Commerce

(5) U.S. Department of Agriculture

(6) U.S. Department of Transportation

(7) U.S. Department of Health, Education and Welfare

(8) Federal Power Commission

b. State:

(1) Michigan Department of Natural Resources

(2) Michigan Department of State Highways and Transportation

(3) Michigan Department of State - Michigan History Division

(4) Michigan Department of Agriculture

(5) Michigan State University - Conference of Michigan Archeology

(6) Michigan Department of Commerce

c. Local:

(1) City of Frankfort

(2) Village of Elberta

(3) Benzie County

(4) Benzie County Planning Commission

7. In addition: Coordination meetings were held between local officials and the Corps beginning early in the planning stage. These included meetings with officials representing the City of Frankfort, Village of Elberta, Benzie County, Benzie County Planning Commission, and other concerned local interests.

8. Also, a site selection committee composed of representatives from the Michigan Department of Natural Resources, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency (EPA), as well as the Corps of Engineers, had several meetings including a field inspection. All agencies represented on the committee have expressed support for the selected sites. A Public Workshop was held in December 1976 at Frankfort.

9. Any person who has an interest which may be affected by the placement of dredge material in the diked disposal area may request a public hearing. The request must be submitted in writing to the District Engineer within thirty (30) days of the date of this notice and must clearly set forth the interest which may be affected and the manner in which the interest may be affected by this activity.

10. This notice is being published in conformance with 33 US Code of Federal Regulations 209.145. Any interested parties desiring to express their views concerning the proposed placement of dredge material may do so by filing their comments in writing with this office not later than 4:30 P.M., 30 days from the date of issuance of this notice.

1 Incl
As stated

MELVYN D. REMUS
Colonel, Corps of Engineers
District Engineer

Notice to Postmasters:

It is requested that the above notice be conspicuously and continuously posted for 30 days from the date of issuance of this notice.

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1027
DETROIT, MICHIGAN 48231

3 June 1976

IN REPLY REFER TO
NCECO-O-15-FR

PUBLIC NOTICE

MAINTENANCE DREDGING - FRANKFORT HARBOR, MICHIGAN

1. The U. S. Army Corps of Engineers proposes to perform maintenance dredging of the Federal Navigation Channels in Frankfort Harbor, Michigan, in 1976 and in each subsequent year when required to remove shoaling. The material dredged from the clean section of the project will be placed, when possible, along the 18 foot contour of the Lake Michigan shoreline southerly of the harbor. Otherwise the clean material will be disposed along the 35' contour of the Lake Michigan shoreline southerly of the harbor. The polluted sections, that is the sections within Lake Betsie, will not be dredged until a confined disposal area is obtained to contain this dredged material. Prior to utilizing such a confined disposal site, a notice giving the location and other details will be issued.

2. This channel maintenance work is being reviewed under the following laws:

Federal Water Pollution Control Act of 1972, the National Environmental Policy Act of 1969, the Fish and Wildlife Act of 1956, the Marine Protection Research and Sanctuaries Act of 1972, the Endangered Species Act of 1973, as well as the various Congressional Acts authorizing construction and maintenance of the Federal project.

3. The annual maintenance dredging of the project is vital to deep draft vessels whose total annual waterborne cargo for the harbor is in excess of 1,100,000 tons.

4. The Federal project consists of a navigation channel that begins at the shore of Lake Michigan and extends into Lake Betsie to the Foot of 7th Street for a total length of approximately 5,000 feet. The material to be dredged consist of sand and silt. Average annual volume of shoaling throughout the entire project is about 40,000 cubic yards. Of this amount, about 30,000 cubic yards is the clean material which is dredged and disposed in open water as discussed in paragraph 1. The dredging is accomplished by a Corps of Engineers hopper dredge working for a period of about 7 calendar days, usually, during summer. In 1976 the dredging is scheduled for July.

- Deep Water Disposal:
SE corner is .7 miles due W. (263°) from end of N. Breakwater

NCECO-0-15-FR
FRANKFORT HARBOR, MICHIGAN

5. The open water disposal sites for the clean material are located in Lake Michigan at the 18 and 35 foot contours (See Sketch).

6. This dredging, including the disposal, is part of the regular annual maintenance dredging. Copies of this notice are being sent to the Environmental Protection Agency, the Department of the Interior the Coast Guard, the State of Michigan, the Department of Commerce, Benzie County, City of Frankfort and other Federal, State and Local agencies, as well as to known interested groups and individuals.

7. The maintenance dredging Environmental Impact Statement is available upon request.

8. Any person who has an interest which may be affected by the disposal of this dredged material may request a public hearing. The request must be submitted in writing to the District Engineer within thirty (30) days of the date of this notice and must clearly set forth the interest which may be affected and the manner in which the interest may be affected by this activity.

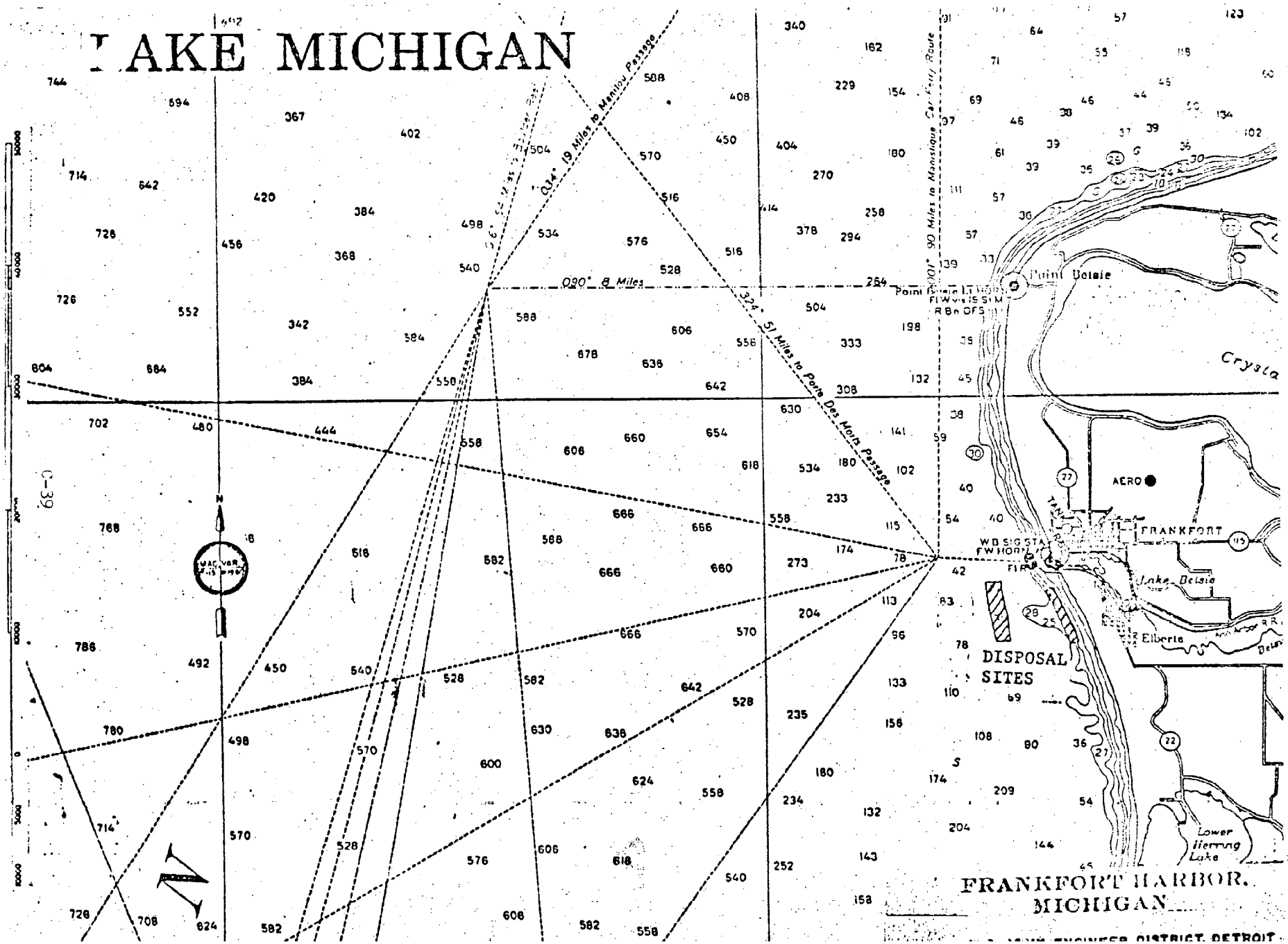
9. Designation of the proposed disposal site for dredged material associated with the Federal project shall be made through the application of the guidelines promulgated by the Administrator EPA in conjunction with the Secretary of the Army. If these guidelines alone prohibit the designation of these proposed disposal sites, any potential impairment to the maintenance of navigation, including any economic impact on navigation and anchorage which would result from the failure to use this disposal site, will also be considered.

10. This notice is being published in conformance with 33 US Code of Federal Regulations 209.145. Any interested parties desiring to express their views concerning the proposed disposal may do so by filing their comments in writing with this office not later than 4:30 P. M., 30 days from date of issuance of this notice.

JAMES E. HAYS
Colonel, Corps of Engineers
District Engineer

Notice to Postmasters:

It is requested that the above notice be conspicuously and continuously posted for 30 days from the date of issuance of this notice.


LAKE MICHIGAN
090° 8 Miles
324° 51 Miles to Port Des Morts Passage
Point Betsie
Crysta
AERO
FRANKFORT
Lake Betsie
Elberta
DISPOSAL
SITES
Lower
Herring
Lake
C-39
FRANKFORT HARBOR,
MICHIGAN

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231

NCECO-O

16 February 1979

PUBLIC NOTICE
REVISION

NCECO-O-15-FR2

MAINTENANCE DREDGING - FRANKFORT HARBOR, MICHIGAN

1. This Public Notice Revision is being issued for the purpose of providing information to various Government agencies and the general public and to solicit their comments and views relative to the proposed work. This revised notice differs from the original notice NCECO-O-15 FR of 3 June 1976 only in the changes in location of the disposal areas.

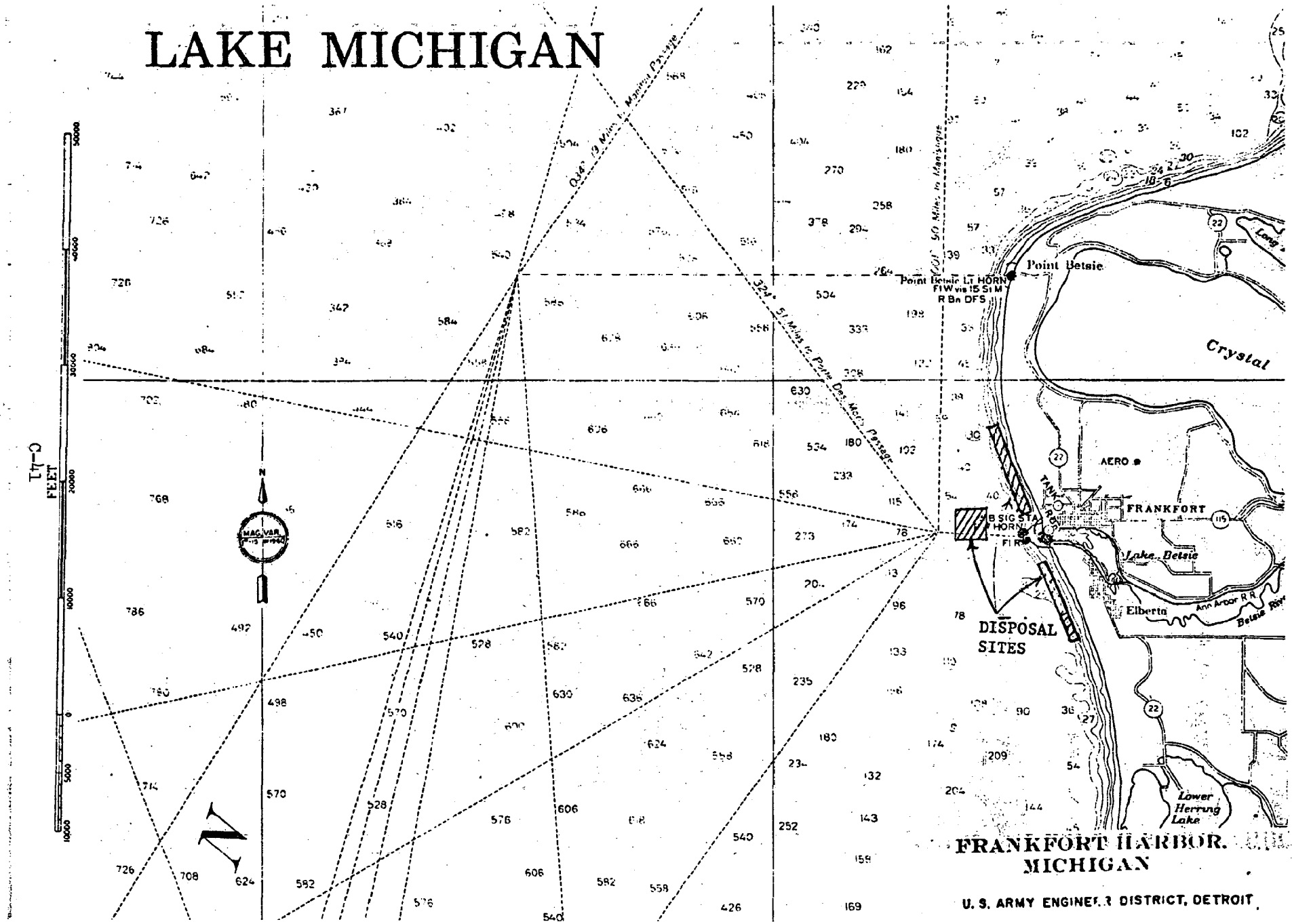
2. In order to secure the maximum practical benefit through the productive utilization of materials dredged from this harbor, the dredged material will be placed, whenever possible, in two priority disposal sites, as close to the Lake Michigan shoreline as possible. Both of these sites, one beginning at a point 0.25 miles to the north of the breakwater and the other at a point 0.25 miles to the south of the breakwater, extend northward and southward, respectively, along the shoreline for a distance of approximately 1.75 mile each (see inclosed sketch). The alternate open water disposal site has been relocated such that the S. E. corner of this 2,600' x 2,600' site is approximately 0.7 miles west (263°) from the outer end of the north breakwater.

3. This notice is being published in conformance with 33 U S Code of Federal Regulations 209.145. Any interested parties desiring to express their views concerning the proposed disposal may do so by filing their comments in writing with this office not later than 4:30 p. m., 30 days from date of issuance of this notice.

MELVYN D. REMUS
Colonel, Corps of Engineers
District Engineer

Notice to Postmasters:

It is requested that the above notice be conspicuously and continuously posted for 30 days from the date of issuance of this notice.



FRANKFORT HARBOR, MICHIGAN

U. S. ARMY ENGINEER DISTRICT, DETROIT

ATURAL RESOURCES COMMISSION
CARL T JOHNSON
E M LAITALA
DEAN [illegible]EON
HILARY [illegible]NELL
HARRY H WHITELEY
JOAN L. WOLFE
CHARLES G YOUNGLOVE

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, BOX 30028, LANSING, MICHIGAN 48909
HOWARD A. TANNER, Director

July 9, 1979

Mr. Phillip McCallister, Chief
Engineering Division
U.S. Corps of Engineers
P.O. Box 1027
Detroit, MI 48231

Re: Maintenance Dredging Projects
Frankfort Harbor
St. Clair River
Monroe Harbor
Detroit Harbor

Dear Mr. McCallister:

The above projects have been reviewed by the Department of Natural Resources Corps Project Review Committee and determined to be projects which would not have detrimental affects to the water quality. Sediment removal for these projects is essential to the continued use of these waters for navigation purposes.

Shoal materials classified as polluted by U.S. EPA criteria shall be disposed of upland in accordance with procedures outlined for individual projects in a manner which will not create environmental problems.

On recommendations of the Corps Project Review Committee, the State of Michigan certifies under Section 401(a) of the Federal Water Pollution Control Act, as amended, P.L. 95-217, that the above projects will comply with the State's water quality standards. Additionally, this document shall serve as a State of Michigan concurrence for the work and fulfill the requirements of Section 404(t) of the Federal Act.

Sincerely,

WATER QUALITY DIVISION

Robert J. Courchaine

Robert J. Courchaine WQD
Division Chief

RJC/JB:tkr
cc: Larry Witte, Chairman
Committee Members

ICHIGA

026 10/76

APPENDIX D

Air Quality Standards

NATIONAL AMBIENT AIR QUALITY STANDARDS

	Primary	Secondary
Suspended Particulates		
(micrograms/cu. meter)		
annual geometric mean	75	
max. 24-hr. conc.*	260	150
Sulfur Oxides		
(micrograms/cu. meter)		
annual arith. aver.	80 (.03 ppm)	
max. 24-hr. conc.*	365 (.14 ppm)	
max. 3-hr. conc.*	-	1300 (.5 ppm)
Carbon Monoxide		
(milligrams/cu. meter)		
max. 8-hr. conc.*	10 (9 ppm)	10
max. 1-hr. conc.*	40 (35 ppm)	40
Photochemical Oxidants		
(micrograms/cu. meter)		
max. 1-hr. conc.*	160 (.08 ppm)	160
Nitrogen Oxides		
(micrograms/cu. meter)		
annual arith. aver.	100 (.05 ppm)	100
Hydrocarbons		
(micrograms/cu. meter)		
max. 3-hr. conc.* (6-9 a.m.)	160 (.24 ppm)	160

*not to be exceeded more than once a year per site.

APPENDIX E

ECONOMIC DATA, EXTRACTED AND UPDATED FROM U.S. ARMY CORPS OF ENGINEERS LETTER REPORT AND DESIGN ANALYSIS, FRANKFORT HARBOR, MICHIGAN. COMPLETE DOCUMENTS ARE AVAILABLE AT U.S. ARMY ENGINEER DISTRICT, DETROIT

FRANKFORT HARBOR DISPOSAL FACILITY

SITE 4-9

SITE 4 COST ESTIMATE*

DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED COST
Clearing		Site	5,000	5,000
Fencing	1,600	LF	10.00	16,000
Granular Fill	7,700	CY	8.00	61,600
Riprap Stone	2,530	Ton	25.00	63,250
Filter Cloth	27,100	SF	.40	10,840
Clay	4,900	CY	12.00	58,800
Sheet Piling	8,400	SF	13.00	109,200
Misc. Steel	12,000	LB	1.00	12,000
Plastic Seal	164,500	SF	.20	32,900
Earth Cover for Seal	12,200	CY	3.50	42,700
Aggregate Surface	700	Ton	7.00	4,900
Pile Cluster	2	EA	1,800	3,600
Access Dredging and Disposal	7,400	CY	7.00	51,800
Weir	1	EA	LS	5,000
Access Road		LS		6,000
Seeding and Mulching	4	AC	850	3,400
Subtotal				486,990
Contingency (15%)				73,049
Subtotal				560,039
Prior Costs				198,600
Engineering and Design				75,000
Supervision and Administration (8%)				44,803
Total Project Cost				878,442
Average Annual Charges				124,348

*Based on June 1979 prices, 6 7/8 percent interest and a 10 year project life.

APPENDIX F

PUBLIC NOTICE AND FINAL SECTION 404 EVALUATION

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231

NCEED-T

PUBLIC NOTICE AND FINAL SECTION 404 EVALUATION

THE MAINTENANCE DREDGING
THE DISPOSAL OF UNSUITABLE MATERIAL
THE CONSTRUCTION OF THE DISPOSAL FACILITY

FRANKFORT HARBOR, MICHIGAN

1. Introduction. This document was prepared in compliance with Section 404 of the Clean Water Act of 1977, and Executive Order 11988, Floodplain Management, issued May 24, 1977.

2. The existing Federal Navigation Project at Frankfort Harbor was authorized by the River and Harbor Act of 1886 and modified under the provisions of Section 107 of the River and Harbor Act of 1960. Section 123 of the River and Harbor Act of 1970 (Public Law 91-611) has authorized the construction, operation, and maintenance of diked disposal and storage areas for the containment of dredged materials for a period not to exceed ten (10) years. See Inclosure #1 for the location of the proposed confinement facility.

3. A Letter Report, a Revised Letter Report, and a Draft Environmental Impact Statement dated September 1977, have been issued to the public. Earlier public notices were issued on 3 June 1976 and revised 16 February 1979 concerning dredging of that portion of Frankfort Harbor which contains material suitable for open lake water disposal. This notice addresses (1) the maintenance dredging of that part of the Frankfort Federal Harbor which is classified unsuitable for open water disposal, (2) disposal of the unsuitable material, (3) the construction of the disposal site, and (4) the dredging (initial and maintenance) of the access and maneuver area to Site No. 4. A Final Environmental Impact Statement is expected to be available to the public in December 1979 or January 1980.

4. The diked disposal site (Site No. 4) is located on the north shore of Lake Betsie in Frankfort between Seventh and Ninth Streets. This site would be used in conjunction with State Forest property located approximately 15 miles inland at Fife Lake State Forest.

5. Executive Order 11988. In compliance with Executive Order 11988, it is noted that the Lake Betsie diked disposal facility is located within the 100 year floodplain. Location of the disposal facility as proposed would have no significant impact upon the floodplain. It would not increase flooding in the area or be affected by flooding from Lake Betsie. The selected site would offer maximum benefit from technical, social, economic, and environmental points of view.

6. Alternative sites were eliminated because of the presence of wetlands, interference with fishing, rejection by local authorities, and lack of the long range recreational benefits for the community.

7. The selected site would ultimately be used in the construction of the City of Frankfort's Mineral Springs Park. Completion of this resource would promote optimal use of the associated floodplain.

8. The action proposed is in conformance with applicable State and local floodplain protection standards.

9. Section 404 Evaluation. Section 404 of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) requires that the Corps of Engineers apply to its own projects the same criteria used in evaluating projects requiring a dredge or fill permit. These criteria include evaluation under 40 CFR 230, an Environmental Protection Agency Regulation, and providing an adequate opportunity for public review and comment on projects. In 40 CFR 230 it is required that any proposed plan involving placement of fill material into navigable waters must be evaluated for effects the action will have on wetlands, water quality, benthic organisms, fisheries (including spawning and breeding areas) and shellfish beds, wildlife, recreation, municipal water supply intakes, and threatened and endangered species. Effects of the project fill activities upon these aspects of the environment are evaluated below.

10. The fill material of concern would be dredged material deposited in the diked disposal facility, which would extend up to 10 feet into Lake Betsie. The lands adjacent to Site No. 4 are park (recreational) on the west side and sanitary treatment and boat launching facilities on the east side. The bottom materials to be removed are organic silts, sandy clay, and silty sand. Certain portions of the deposits have been classified by the U.S. Environmental Protection Agency as unsuitable for open water disposal. These portions would be placed in the confined disposal facility and Fife Lake State Forest. Materials used in the construction of the confined disposal facility would consist of steel sheet piling, riprap, graded granular fill (sand and gravel), clay, sand-bentonite mix and other suitable materials. No clay would be placed in the water.

11. The Frankfort Federal Harbor would be dredged with either hydraulic or bucket equipment. Site No. 4 would be filled during the 1981 calendar year. If the harbor is dredged with bucket equipment, the material would be unloaded from scows and transferred into trucks. The trucks would unload the contaminated dredged material at Site No. 4 or at the Fife Lake State Forest Site, which is approximately 15 miles from the City of Frankfort. During the construction of Site No. 4, the following approximate quantities of material would be deposited into the open waters of Lake Betsie:

900 cubic yards of granular material
700 cubic yards of riprap stone

Should the first season dredging (1981) be accomplished by hydraulic equipment, the material will be deposited into Site No. 4. The weir structure would provide for a controlled amount of water overflow.

Applicable Laws.

12. The project has been reviewed under the following laws:

a. Fish and Wildlife Coordination Act
b. National Historic Preservation Act of 1966
c. National Environmental Policy Act 1969
d. Coastal Zone Management Act of 1972
e. Marine Protection Research and Sanctuary Act of 1972
f. Endangered Species Act of 1973
g. Clean Water Act of 1977

13. Both disposal sites (Site No. 4 and Fife Lake State Forest) are U.S. Environmental Protection Agency designated sites. Furthermore, the disposal of contaminated dredge material into Site No. 4 and Fife Lake State Forest has been coordinated with the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Michigan Department of Natural Resources and the City of Frankfort.

Wetlands.

14. No wetlands occur at Site 4 along the shore of Lake Betsie.

Water Quality.

15. Scow unloading by crane and clamshell near the shoreline may involve some accidental spillage. The impact of spillage is expected to have only local significance as a stress on biota, because the nearshore ambient water is turbid. An oil skimmer and weir would be used to control the return of water to the lake, and splash pads and other necessary devices would be used to minimize erosion. Contractors would be instructed to perform in compliance with appropriate portions of the Michigan Inland Lakes and Streams Act 346 of 1972, and the Michigan Soil Erosion and Sedimentation Control Act 347 of 1972, in all phases of construction and operation. These Acts limit increases in sediment load and other adverse water quality effects from construction.

16. The sediments to be dredged contain excessive quantities of volatile solids, chemical oxygen demand, phenol, nitrogen, phosphorus, oil and grease, plus excessive levels of lead and zinc. Site 4 would be lined with clay and/or other suitable materials to prevent seepage of separated water. The skimmer placed in the containment area would remove oil and grease from the surface so that clear water with insignificant amounts of deleterious substances would be returned to the lake. The overflow would be monitored at control points to be certain that no excessive concentrations go undetected. Should concentrations be found to be unsafe or unsuitable for release into Lake Betsie, operations would cease and material within the containment areas would be subjected to greater retention times until concentrations reach suitable levels.

Benthos, Including Shellfish.

17. Lake Betsie receives large amounts of nutrients from adjacent urban areas and as a result is biologically very productive. The benthic environment is dominated by tubificid worms and highly organic sediments.

Waters in the area would become more turbid during construction of the disposal facility resulting in a temporary local depletion and simplification of the food chain. A small area of habitat would be filled in by the south dike wall of the facility. No commercial shellfish beds exist in either of the disposal areas.

Fishery Resources.

18. A small amount of panfish spawning, rearing, and feeding habitat would be destroyed from construction of the south wall of the facility. Since the nearshore bottom sediments are highly organic, and only marginally suitable as nesting habitat for such fish, the loss of suitable habitat would be minimal. Other fish utilizing the surrounding area for feeding or cover would be displaced during construction and from any spillage which occurs during operation.

19. Increased turbidity and reduced oxygen levels associated with an increase in silt and suspended solids in the water column due to construction and disposal could have short term adverse effects on sight feeding species. Construction of the facility could be expected to drive fish away from the immediate area. There would be no significant water quality effect on fish populations in the lake, however.

20. Migration patterns of fish which spawn in the Betsie River are not expected to be affected by habitat displacement or water quality effects of construction, as they would take place in shallow nearshore water aside from the main flow through Lake Betsie. Lake trout are mainly cold water spawning species; they require a rock substrate for successful reproduction; they would not be likely to utilize Lake Betsie for spawning. Brown trout and steelhead, which are respectively, late fall and early spring spawners, would be expected to utilize areas of fine gravel and rocks upstream in the Betsie River.

Wildlife.

21. There would be no significant impact on wildlife.

Recreation.

22. Public fishing in Lake Betsie could be poor in the immediate project vicinity during construction of Site 4.

23. No permanent detrimental effect on the potential recreational use of the area would occur; rather, following the first 2 years of the 10-year operation period, Site 4 would become part of the City of Frankfort's shoreline development project. It would enhance the recreational value of the land for the city and its visitors.

24. The shoreline of Lake Betsie within the project area is in a disturbed condition. The scenic quality of this part of the shoreline would be improved by the action proposed at Site 4 following the filling of the disposal area.

Commercial Fishing.

25. No commercial fishery exists in Frankfort Harbor.

Threatened or Endangered Species.

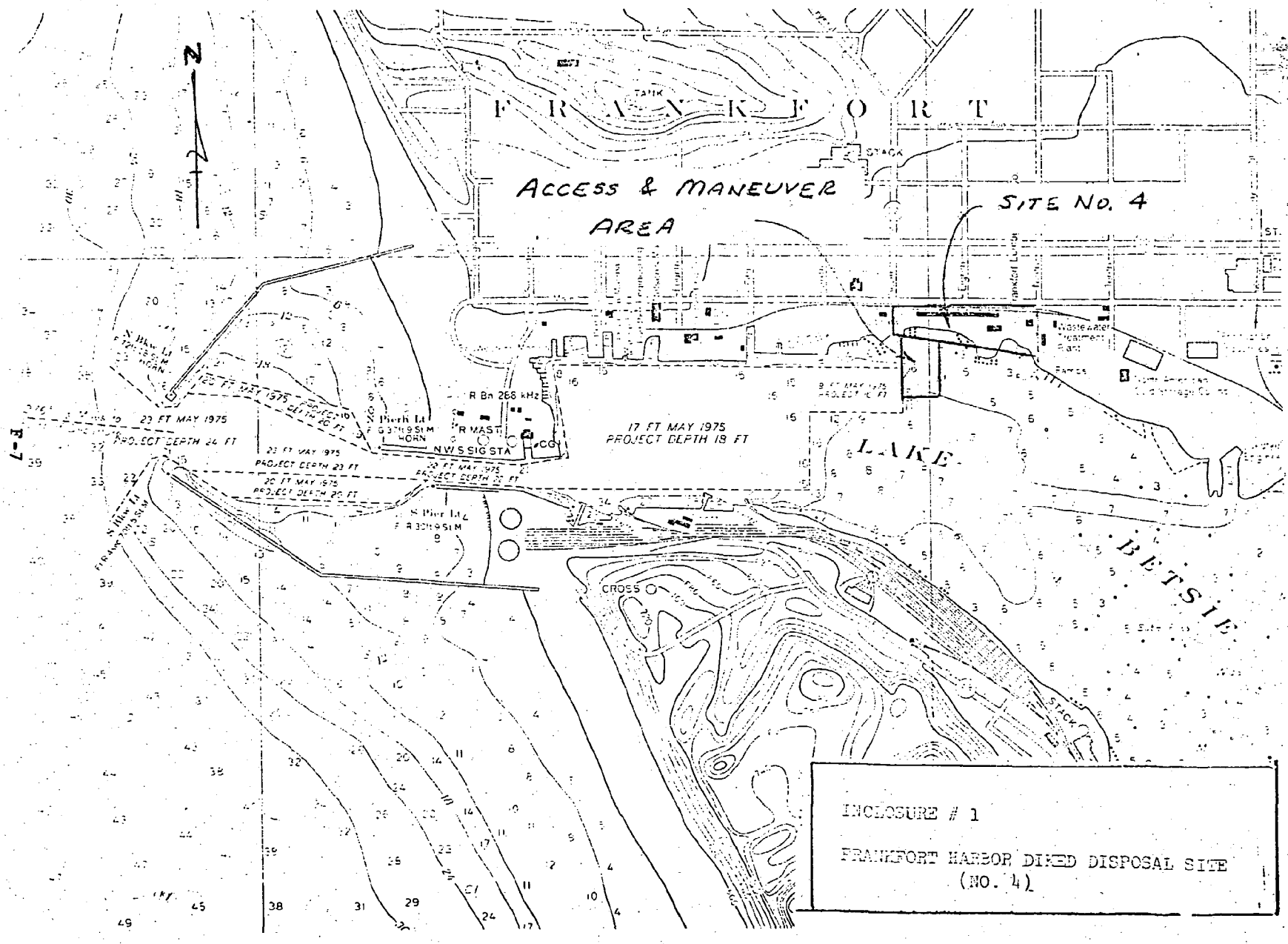
26. No endangered or threatened plant or animal species listed in the Federal Register 17 January 1979 or thereafter has been reported for this shoreline area or for Fife Lake State Forest. The extensive and intensive disturbance of the area would limit use by those shoreline and raptorial bird species which frequent the shorelands of the Great Lakes.

Municipal Water Supplies.

27. The nearest public water supply sources in the project area are one-quarter mile north of the Lake Betsie northern shoreline. The public water supply is obtained from two wells in a location protected by overlying clay and by the natural gradient of groundwater flow, which is lakeward. The distance, gradient, and ground materials would isolate dredged materials from the aquifer. Therefore, there would be no impact upon municipal water supplies. The nearest private water supplies are all obtained from the groundwater and are adequately isolated from the project by the prevailing movement of groundwater in the region. No project effects would be expected on private wells. The liner (clay and/or other suitable materials) for the disposal facility would provide additional protection.

28. Conclusions and Determinations. An ecological evaluation has been made following the evaluation guidance in 40 CFR 230.4, in conjunction with the evaluation considerations in 40 CFR 230.5. Appropriate measures have been identified and incorporated in the proposed plan to minimize adverse effects on the aquatic environment as a result of the discharges. Consideration has been given to the need for the proposed activity, the availability of alternative sites, and methods of disposal that are less damaging to the environment, and such water quality standards as are appropriate and applicable by law.

29. Findings. Based on the above determinations, it is found that the discharge sites for Frankfort Harbor, Michigan, Maintenance Dredging and Confined Disposal, have been specified through the application of the Section 404(b)(1) Guidelines.



INCLOSURE # 1

FRANKFORT HARBOR DIKED DISPOSAL SITE
(NO. 4)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
EAST LANSING FIELD OFFICE (ES)
Room 301, Manly Miles Building
1405 S. Harrison Road
East Lansing, Michigan 48823

IN REPLY REFER TO:

January 23, 1980

Colonel Robert V. Vermillion
U.S. Army Engineer
Detroit District
P.O. Box 1027
Detroit, Michigan 48231

Dear Colonel Vermillion:

We have reviewed the Public Notice and Section 404 Preliminary Evaluation for the maintenance dredging, the disposal of unsuitable materials, and the construction of the confined disposal facility at Frankfort Harbor, Benzie County, Michigan. The following comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401 as amended; U.S.C. 661 et seq.), and in compliance with the intent of the National Environmental Policy Act of 1969.

Under Fishery Resources, paragraph 20, incorrect information has been presented, and we believe a correction should be published. On November 28, 1978 we forwarded a letter to Colonel Remus (copy attached) detailing current fishery information. As requested, an additional letter was forwarded on December 12, 1978 (copy attached) providing detailed fishery information to Mr. McCallister on the waters adjacent to the proposed disposal site number 4. As you can note, we collected eighteen lake trout, two steelhead, and two brown trout at the project site. Your report indicated no use of the area. Several of the lake trout were in a prespawning or postspawning spawning condition (ripe, gravid, or spent), as were the brown trout. We are not suggesting that these fish were utilizing this area as a spawning site, but we wish to point out that they were definitely present in the shallow nearshore waters at the site, and were actively feeding. This was evidenced by the fact that an angler casting from shore caught a lake trout in the project area while personnel from our office were present.

Periods of dredging activity, as proposed, will need to be adjusted so as not to interfere with the migration and spawning activities of these fish species.

If there are any questions, or you require additional information, please contact our office.

Sincerely yours,

Clyde R. Odin
Supervisor

Attachments

November 28, 1978

Colonel Melvyn D. Remus
U.S. Army Engineer District,
Detroit
P.O. Box 1027
Detroit, Michigan 48231

Attention: Mr. Rich Gutleber

Dear Colonel Remus:

Personnel from our East Lansing Field Office conducted limited fish sampling at the proposed modified confined disposal site on Lake Betsie, Frankfort, Michigan on October 30, 1978 per your environmental sections request. The fish sampling was conducted in water from two to four feet deep within 100 feet of the shoreline. Water temperature was 47°. In 52 minutes of electrofishing with the R/V Killfish, we were able to successfully net 60 fish representing 10 species:

18 Lake Trout	1 Smallmouth Bass
2 Steelhead	1 Burbot
2 Brown Trout	3 Redhorse
4 Rock Bass	20 Carp
1 Northern Pike	8 White Sucker

Many additional fish were seen but not collected. No additional species were noted.

Sincerely,

Clyde R. Odin, Supervisor

December 12, 1978

Mr. P. McCallister
Chief Engineering Division
U.S. Army Engineer District, Detroit
P.O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

Reference is made to your letter of November 22, 1978, which requested our comments or approval on extending the presently approved diked disposal facility an additional 100 feet into Lake Betsie at Frankfort, Michigan.

After recently conducting preliminary fish sampling at the proposed expansion site (data attached), the Fish and Wildlife Service has found the proposed project to be an unacceptable encroachment upon the bottomland of Lake Betsie. Our reasons are as follows:

1. The extension of the disposal structure would result in the loss of two and one half acres of Lake Betsie bottomland.
2. The water quality at the site appeared to be good and supported a diverse population of fish species at the time sampled.
3. Forage fish species were encountered during the sampling. The occurrence of forage species indicates the presence of benthic and/or zooplankton organisms on which they feed.
4. The shallow waters provide potential spawning areas and needed nursery areas for fish fry.
5. It is the policy of the Fish and Wildlife Service to support upland disposal of dredged materials as opposed to the filling of bottomlands or wetlands.
6. Executive order 11988 directs governmental agencies "to avoid direct or indirect support of flood plain development wherever there is a practicable alternative." Other alternatives do exist to filling in the bottomlands. Paragraph G (2.22) of the draft Environmental Statement (Sept., 1977) lists site 5A as being within a flood hazard area.

Attached for your review are fishery data collected on October 30, 1978 at the proposed fill area along with a map showing the approximate sampling locations. If additional data is deemed necessary to support

our objection to the filling of the additional lake bottomlands, a four season sampling program should be undertaken. Extended sampling would augment the seasonal fish species utilization data; develop zooplankton densities charts; identify potential fry utilization areas and species composition; and identify waterfowl utilization and feeding activities for the area.

Four season sampling would most likely verify the findings indicated by our electrofishing efforts. However, there would be a much greater fish mortality due to the use of gill nets.

Inasmuch as the Corps of Engineers has not developed an acceptable plan for the creation of new lake bottomlands as mitigation for the proposed bottomland encroachment and have also found it unacceptable to develop a new wetland area at an upland site as a reciprocative measure, we cannot agree with the proposed expansion. We cannot condone the further erosion of our valuable coastal shoreline for unnecessary confined disposal structures. If the originally agreed upon disposal plan is not acceptable at this time, we suggest that the problem be turned over to the Site Selection Committee for further consideration.

Sincerely yours,

Ray C. Williams
Acting Supervisor

Attachments

cc: U.S. EPA
ELAO

TABLE 1

Frankfort Harbor/Lake Betsie (Proposed CDF Expansion) 10/30/78

Method: Electrofish Vessel: R/V Killifish

Water Temperature: 47°F Time: 9:00 AM EST

Depth: 2 - 4 feet Collection Time: 52 minutes

Species	Length (mm)	Weight (g)	Sex	Gonad	Fin Clip
Lake Trout	746		M	R	NC
Lake Trout	711		-	-	AdRV
Lake Trout	707		F	G	RV
Lake Trout	706		-	-	RV
Lake Trout	740		F	G	RV
Lake Trout	739		M	S	NC
Lake Trout	750		-	-	AdRV
Lake Trout	688		M	R	Ad
Lake Trout	735		F	G	RV
Lake Trout	732		-	-	LV
Lake Trout	799		M	R	AdRV
Lake Trout	742		-	-	RV
Lake Trout	705		F	G	RV
Lake Trout	716		-	-	RV
Lake Trout	778		M	R	RV
Lake Trout	729		M	R	RV
Lake Trout	690		-	-	RV
Lake Trout	757		M	R	LV
Rock Bass	190				
Rock Bass	215				
Rock Bass	172				
Rock Bass	157				
Smallmouth Bass	78				
Northern Pike	1010				
Brown Trout	669	4850	F	G	NC
Brown Trout	572	-	F	G	NC
Steelhead	709	3300			
Steelhead	672				
White Sucker	507				
White Sucker	112				
White Sucker	382				
White Sucker	403				
White Sucker	408				
White Sucker	381				
White Sucker	401				
White Sucker	428				

TABLE 1 CONTINUED

Species	Length (mm)	Weight (g)	Sex	Gonad	Fin Clip
Redhorse Sp	559				
Redhorse Sp	445				
Redhorse Sp	434				
Burbot	279				
Carp	629				
Carp	616				
Carp	592				
Carp	713				
Carp	824				
Carp	573				
Carp	662				
Carp	664				
Carp	688				
Carp	565				
Carp	572				
Carp	572				
Carp	525				
Carp	585				
Carp	765	8500			
Carp	552				
Carp	492				
Carp	521				
Carp	557				
Carp	507				

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF:

31 JAN 1980

Colonel Robert V. Vermillion
District Engineer
U.S. Army Corps of Engineers, Detroit
Box 1027
Detroit, Michigan 48231

Dear Colonel Vermillion:

We have reviewed the Public Notice for the proposed maintenance dredging, disposal of unsuitable material, and the construction of a confined disposal facility at Frankfort Harbor, Michigan. Based on our review of the subject notice and the Draft Environmental Impact Statement (EIS) prepared for this project, we offer the following comments for your consideration.

It is noted in paragraph 11 of the Public Notice that dredging would take place during two periods, spring and autumn. These are periods when dredging could have it's greatest impact on fisheries; therefore, we recommend that specific dredging activities at Frankfort Harbor be coordinated with the U.S. Fish and Wildlife Service and the Michigan Department of Natural Resources in order to minimize potential impacts. We will defer any other comments until we have had an opportunity to review the Final EIS.

Sincerely yours,

William D. Franz

for Barbara J. Taylor, Chief
Environmental Impact Review Staff
Office of Environmental Review

MICHIGAN UNITED CONSERVATION CLUBS
2101 Wood St. ● P.O. Box 30235 ● Lansing, MI 48909 ● 517-371-1041

January 24, 1980

Robert V. Vermillion
Colonel, Corps of Engineers
District Engineer
P.O. Box 1027
Detroit, MI 48231

Dear Colonel Vermillion:

RE: NCEED-T - Public Notice and Section 404 Preliminary Evaluation.
The Maintenance Dredging; The Disposal of Unsuitable Material; The Construction of the Disposal Facility

Frankfort Harbor, Michigan

The Michigan United Conservation Clubs is very concerned about the above referenced project and its impacts.

Perhaps the most important concern we have is the containment of spoils adjacent to and in the waters of Betsie Lake. We are perplexed at how this site has been determined to "offer maximum benefit from...environmental points of view". We question how this can offer maximum environmental benefits when the sediments to be placed in this site contain "excessive quantities of volatile solids,...oil, grease, lead and zinc."

Further, we do not feel that the impacts to the project area have been accurately portrayed. As we understand, the U.S. Fish and Wildlife Service conducted a census in October 1978 within the proposed project area. In this census 60 fish of various species were collected including 18 lake trout, 2 steelhead and 4 brown trout. In lieu of this, we do not understand how under Paragraph

PRESIDENT
GLENN CORBETT, 20647 Country Club, Harper Woods, MI 48236
VICE PRESIDENTS
GLENN GEERLINGS, 9531 New Holland, Zeeland, MI 49464
ROBERT SLINGERLEND, 3201 Lake George Rd., Lake Orion, MI 48035
DWIGHT ULMAN, 2745 E. Dexter, Saginaw, MI 48603
EXECUTIVE DIRECTOR
THOMAS L. WASHINGTON, P.O. Box 30235 Lansing, MI 48909
TREASURER
OWEN C. (Chuck) BURNS, 12210 M.A.C. Drive N.E., Rt. 3, Belding, MI 48809
BOARD REP.
GORDON ROY, Rapid River, MI 49878
REGIONAL VICE PRESIDENTS
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GERALD GOODMAN, Rt. 1 Box 32 Iron River, MI 49935
JOHN B. EICHINGER, 203 S. Case St. Marion, MI 49665
JOHN WHITMORE, 32024 Holt, Farmington Hills, MI 48018

Northern Michigan Office, Rt. 1, Box 1509, Grayling MI 49738, 517/348-2316

20 such statements as "migrations of fish which spawn in the Betsie River are not expected to be affected by habitat development or water quality effects" can be made. It would seem that a project such as this could have significant impacts on fish using the area, especially if the project is conducted during the spawning periods.

Finally, we would like to know if the maneuver and access area is specifically designed to be used in conjunction with disposal site No. 4. If this is the intent and other alternatives exist, would this not negate the need for the dredging of this area?

With these concerns expressed by our organization, we can find no alternative but to ask that this permit not be issued at this time.

We appreciate the opportunity to have commented on this proposal and will be waiting for your response.

Very truly yours,

Raymond Rustem

Raymond Rustem
Northern Michigan Field Representative

cc: Michigan Department of Natural Resources
Land Resource Programs Division
U.S. Fish and Wildlife Service
East Lansing Field Office
U.S. Environmental Protection Agency
Region V

ZETTERBERG & ZETTERBERG
ATTORNEYS AT LAW
319 HARVARD AVENUE
CLAREMONT, CALIFORNIA 91711

STEPHEN I. ZETTERBERG
CHARLES L. ZETTERBERG
THERESA C. SHAW
FUNGLAN PERSIMMON

TELEPHONE
(714) 621-2971

Jan 14, 1980

Robt. Vermillion
Col., Corps of Engineers

from: Stephen I. Zetterberg

Dear Sir:

Your NEED-+ re 404 Preliminary Evaluation dated (not legibly) ? Dec. 1979 addressed to Arvid Zetterberg, Pt. Betsie Rd, Frankfort, Mich. 49635, re dredging and disposal of unsuitable material (Frankfort Harbor, Michigan) was forwarded to me Jan 15, 1980 by the Frankfort Post Office.

Our concern is that sand (suitable) dredging in Betsie Lake (Bay) be deposited in not over 18 ft. of water, north of the Frankfort breakwater, in order to nourish the beaches north to Point Betsie. We own 2200+ ft of shore between Frankfort and Pt. Betsie, and the Harbor Breakwater plus dumping of Betsie dredging in deep water has been a principal factor in erosion (lateral) of about 300 ft. E-W of the shore.

Also, dredging should be in summer (not spring & autumn) for suitable material, because that's when the waves & wind go north.

Please substitute my name for Arvid (my deceased father) & put me on your list at above address. Thanks

Stephen I. Zetterberg

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231

NCEED-ER

28 FEB 1980

Mr. Clyde R. Odin, Supervisor
U.S. Fish & Wildlife Service
East Lansing Field Office
Room 301, Manly Miles Building
1405 S. Harrison Road
E. Lansing, MI 48823

Dear Mr. Odin:

Thank you for your comments under the Fish and Wildlife Coordination Act on the Public Notice and 404 Evaluation for Maintenance Dredging, Disposal of Unsuitable Material, and Construction of the Disposal Facility at Frankfort Harbor, Michigan.

The 404 Preliminary Evaluation did not include the detailed fish data which your office had provided. This information is included in the Final Environmental Impact Statement (FEIS) which is to be released in February 1980. It was not intended in the 404 Evaluation to indicate that fish do not use the project area, only that no impacts to fish spawning or migration are anticipated. The last sentence in paragraph 20 has been deleted from the Final 404 Evaluation, which is included in the FEIS.

The environmental effects of dredging and disposal are evaluated in the Final Environmental Impact Statement. The FEIS contains the information provided on fishes present near the disposal site and evaluates the potential adverse environmental effects of the project on fish spawning and migration. Dredging schedules for each harbor are coordinated on an annual basis with your office, the Michigan Department of Natural Resources, and the U.S. Environmental Protection Agency. Dredging for Frankfort Harbor would be scheduled to minimize interference with fish migration or spawning.

Sincerely,

for P. McCALLISTER
Chief, Engineering Division

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231

28 FEB 1980

NCEED-ER

Ms. Barbara Taylor, Chief
Environmental Impact Review Staff
Office of Environmental Review
U.S. Environmental Protection Agency
230 S. Dearborn Street
Chicago, IL 60604

Dear Ms. Taylor:

Thank you for your review of the Public Notice and Preliminary 404 Evaluation for maintenance dredging, disposal and construction of a confined disposal site at Frankfort Harbor, Michigan.

Dredging schedules are reviewed on an annual basis with your office, the U.S. Fish and Wildlife Service and the Michigan Department of Natural Resources. At the time of review, the dredging schedule would be determined and adjusted, if necessary, to minimize adverse impacts on fisheries as well as recreational use.

Sincerely,

for B. J. McCallister

P. McCALLISTER
Chief, Engineering Division

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1027
DETROIT, MICHIGAN 48231

IN REPLY REFER TO

26 FEB 1980

NCEED-ER

Mr. Raymond Rustem
Michigan United Conservation Clubs
2101 Wood Street
P.O. Box 30235
Lansing, MI 48909

Dear Mr. Rustem:

Thank you for your comments concerning the Public Notice and Section 404 Preliminary Evaluation for Maintenance Dredging, Disposal of Unsuitable Material and Construction of the Disposal Facility at Frankfort Harbor, Michigan.

The site for containment of contaminated dredged materials was selected from among eleven considered. To quote the entire sentence from which you excerpted, "The selected site would offer maximum benefit from technical, social, economic, and environmental points of view." Thus all of these aspects were part of the selection process. On the basis of these criteria the selected site offered maximum benefit relative to the other sites. In addition to social, technical and economic, it would have the following environmental advantages: Its use would not involve filling of wetlands; it would have no long term environmental effects; it would not require hauling of dredged material through the Frankfort business district; and it would provide recreational benefits from its ultimate use in the City's Mineral Springs Park. It would have some adverse water quality effects during construction of the facility and during the dredging process, but these would be temporary and minor and did not disqualify the site as the best among the eleven from an overall point of view. The facility would be built to avoid disposing the potentially contaminated materials in the open waters of Lake Michigan. The materials would be confined by a six inch layer of bentonite or other suitable material to prevent their seepage into the surface or ground water of the area.

18 FEB 1980

NCEED-ER
Mr. Rustem

It should be clarified that the Section 404 Evaluation does not address the effects of the entire project. It addresses only the effects of project fill activities (see paragraph 9, page 2, Public Notice and 404 Evaluation). The effects of the entire project have been evaluated in the Draft Environmental Impact Statement of September 1977 and will be reevaluated in the Final EIS to be released this month. You will be sent a copy of the FEIS for review. The placement of fill material used in construction of the facility (see Evaluation, page 2, paragraph 11) would not be expected to have a significant effect on migration of fish through Lake Betsie because of the limited size of the construction involved and the relative width of Lake Betsie. Dredging schedules are reviewed on an annual basis by the Michigan Department of Natural Resources, U.S. Fish and Wildlife Service and the U.S. Environmental Protection Agency. At time of review, a schedule for Frankfort would be set up to avoid disturbance of possible migration or spawning of fish.

The maneuver and access area is specifically designed to be used in conjunction with the disposal facility proposed on Site 4. Since Site 4 proved to be the best site based on effects on water quality, biota, recreation, esthetics, social well-being, economics, and land use plans, it is the only alternative which would be appropriate to implement. The selection has taken into consideration the water quality effects of access channel dredging. A discussion of the alternative disposal methods will be included in the Final EIS.

As discussed in your conversation with Mr. Nicholson of our Environmental Resources Branch on 14 February, the dredger would be required to protect against spillage in transferring the dredged materials from the barge to the trucks. This operation has been field tested and has proven to be very satisfactory.

If you have any further questions, please get in touch with me or Mr. Abram Nicholson of my staff at (313) 226-6752.

Sincerely,

E. A. McCallister

E. P. McCALLISTER
for Chief, Engineering Division

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231

NCEED-ER

26 FEB 1980

Mr. Steven I. Zetterberg
319 Harvard Avenue
Claremont, California 91711

Dear Mr. Zetterberg:

Thank you for your letter regarding the 404 Preliminary Evaluation on maintenance dredging at Frankfort Harbor.

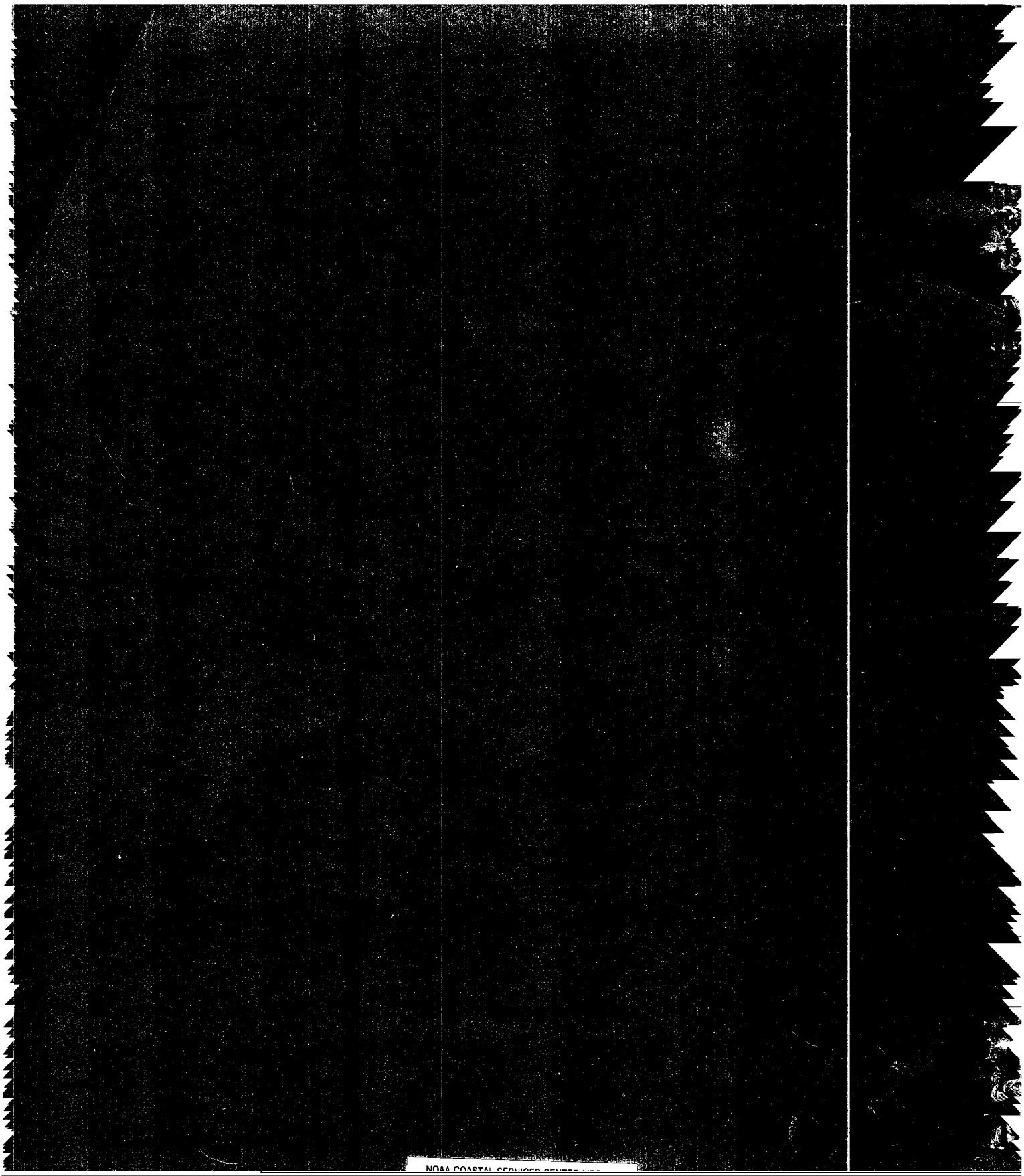
Investigations have shown that the Federal navigation structures at Frankfort were responsible for about 45% of the erosion in the beach between 1/4 mile and 2 miles north of the northerly breakwater. A non-structural measure for mitigation of this erosion was discussed in the Final Environmental Impact Statement for Mitigation of Shore Damage of September 1976. One of the measures of the non-structural plan is the establishment of maintenance dredging guidelines which place priority on dredged material deposition along eroding shorelines.

The priority for diposal of clean materials is "disposal of the dredged materials... as close as practicable along the Lake Michigan shoreline beginning about 0.25 miles (0.4 km) north of the breakwater and extending northerly for a distance of about 1.75 miles (2.8 km)." Unsuitable materials must be placed in a confined disposal facility, as addressed in the 404 Evaluation.

The depth at which the dredge can dispose the material at Frankfort Harbor has not been determined. The time period of dredging would be based on environmental considerations, including effects of waves and currents on the material for beach nourishment. It is anticipated, however, that disposal would occur near the 18 foot contour, and that deposited sands would enter the beach zone by wave action. The time period is subject to approval of the Michigan Department of Natural Resources, the U.S. Environmental Protection Agency, and the U.S. Fish and Wildlife Service.

Sincerely,

P. McCALLISTER
Chief, Engineering Division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