UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
4601 Hammersley Road, Madison, Wisconsin 53711

August 29, 1977

Andrew C. Remson, Jr.
Colonel, Corps of Engineers
Chicago District
219 South Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

We have reviewed the draft environmental impact statement relating to operation and maintenance and dredge material disposal at Green Bay Harbor, Wisconsin. We suggest that erosion control practices be developed to minimize erosion and sediment during dredging operations. We also suggest that temporary vegetation be established in the confined disposal facility as part of its operation and maintenance.

We appreciate the opportunity to review and comment on this draft environmental impact statement.

Sincerely,

J.C. Hytry
State Conservationist

1. The Chicago District of the Corps of Engineers contacted Mr. Martin of the Madison, Wisconsin office of the U.S. Soil Conservation Service on 2 September 1977 to clarify the U.S. SCS comments. Mr. Martin indicated that the second sentence of the 29 August 1977 letter of comment should have read, "We suggest that erosion control practices be developed to minimize erosion and sediment during disposal operations." As stated in paragraphs 1.5.9 and 4.7.2, the confined disposal facility will be constructed in such a manner that no dredged material placed within the facility should renter the waters of Green Bay. However, Mr. Martin indicated that the letter of comment should have referred specifically to wind erosion not water erosion. Therefore, the text of paragraph 4.7.3 has been modified to address wind erosion.

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

August 25, 1977

Colonel Andrew C. Remson, Jr.
District Engineer
Department of the Army
Corps of Engineers
Chicago District
219 South Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

This is in reference to your draft environmental impact statement entitled, "Relating to Operation, Maintenance, and Dredged Material Disposal at Green Bay Harbor Wisconsin." 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

Enclosure - Memo from Great Lakes Environmental Research Laboratory, August 5, 1977

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

AUG 1 0 1977

August 5, 1977

TO: Director
Office of Ecology and Environmental Conservation, EE

FROM: Eugene J. Aubert
Director, GLERL, RF24

SUBJECT: DEIS 7707.12 - Green Bay Harbor, Operation, Maintenance, and Dredged Material Disposal

The subject DEIS prepared by the Corps of Engineers, Chicago District, on the maintenance dredging of Green Bay Harbor and disposal of polluted spoil has been reviewed and comments herewith submitted.

The proposed kidney-shaped island for the disposal of polluted dredge spoil from Green Bay Harbor was designed to become a part of a recreational boat harbor. The construction of that harbor is not discussed in the Statement, although the location of harbor breakwaters will significantly change water circulation in the vicinity of the project. Without the harbor breakwaters, nearshore current flowing from west to east will form an anticlocwise gyre in the lee of the island. The concave shape of the island will strengthen the formation of a gyre. As a result, some deposition of suspended organic material will take place and water quality will decrease. The Manager of the Green Bay Metropolitan Sewerage District stated that even though the effluent is well-treated, it does degrade the water quality somewhat and that may have an adverse impact on the recreational value of the proposed facility. Reversal of the nearshore current and improvement of water quality can be expected during March, April, and May when prevailing winds blow from the northeast.

1. It is true that a possible future use of the confined disposal facility is as a breakwater for a proposed small-boat harbor. However, as stated in paragraph 1.5.7, the construction of a small-boat harbor is not a part of the proposed action considered in this statement and a separate EIS will be prepared for the proposed small-boat harbor. As stated in paragraph 4.6.4, the Chicago District has completed an investigation of possible water circulation problems at the confined disposal facility site. Figure 1-2, which in the DEIS showed the preliminary design for the small-boat harbor has been altered in the FEIS to show only structures covered by this statement.

   It is possible that a gyre will be formed in the concave portion of the disposal area, under a west to east wind direction. The effects of such a gyre formation are difficult to estimate due to the many variables involved. The impacts of gyre formation on sedimentation in the concave area, though, are thought to be minimal. When winds are out of the west, a major portion of the Fox River plume, including discharge from the Sewerage District is expected to be diverted north of the disposal area - and not pass by the area of gyre formation.

It is suggested that examination be made of conditions which will exist with the proposed harbor breakwaters in place. Breakwaters should be placed in such a way that the easterly water flow would be diverted around the island and the less frequent and more clean westerly flow be used to flush the harbor. Model tests would be needed to firm up the design.

Sediments to be dredged have been sampled by USEPA in July 1969. It was found that sediment north of the mouth of Fox River is heavily polluted by discharge from a sewage treatment plant. In 1975 the plant was upgraded and expanded and presently treats the municipal-industrial discharge from an 82-square-mile area. Sampling of the sediment should be repeated to determine sediment pollution level with the upgraded treatment plant in operation.

Some inconsistencies were noted. Design capacity of the confined disposal facility is given in par. 1.5.6 as 1,200,000 cubic yards and in par. 4.4.1 as 1,500,000 cubic yards. Location map, figure 1-2, indicates a small boat harbor of 40 acres; meanwhile par. 1.5.7 lists an approximate 26-acre area of protected water suitable for a small boat harbor.

2. Final placement of the breakwaters from shore out to the confined disposal facility will be evaluated as a part of a separate future small-boat harbor project report. Preliminary planning indicates that circulation openings should be placed in both east and west breakwaters.

3. Resampling of botton sediments will be performed in October 1977 by Region V, USEPA.

4. Text of paragraphs 1.5.7, 4.4.1 and 4.4.2 have been modified as per comment.

United States Department of the Interior

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

(ER-77/670)

August 30, 1977

Colonel Andrew C. Remson, Jr.
District Engineer
U.S. Army Engineer District,
Chicago
219 South Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

In reply to your July 8, 1977 letter, we are providing the following comments which represent the Department of the Interior response on the draft environmental statement for Operation, Maintenance, and Dredged Material Disposal at Green Bay Harbor, Brown County, Wisconsin.

One advantage of the proposed confined disposal facility site, as indicated in Section 1.5.7 on page 1-7 of the draft statement, would be the creation of a protected water area of approximately 26 acres that would be suited for a small boat harbor. This water area could be created by constructing a breakwater from the disposal site island to the shore. Because of Bay Beach Park's proximity (approximately 600 feet) to the proposed disposal facility site, Section 2.2.5 on page 2-15 should be expanded to include a more detailed description of the park and a discussion of its relationship with existing and potential recreational boating in the project area. Also, the final statement should note that the Green Bay Wildlife Sanctuary was acquired with assistance from the Land and Water Conservation Fund (Project Nos. 55-00436 and 55 - 01072). The sanctuary is located immediately to the southeast of Bay Beach Park.

The Green Bay/Brown County Planning Commission would like the flexibility to use other methods than fencing to control access to the island. We concur in this request and suggest the final EIS reflect the Commission's proposal.

Page 2-7, paragraph 2.1.15 briefly discusses the sediment of the area to be dredged. We understand that there are high concentrations of PCB's in the sediments and the Wisconsin Department of Natural Resources (DNR) believes that various aspects of this condition should be studied before, during, and after dredging and spoil containment. We share the DNR's concern and feel that the proposed project provides an excellent opportunity to conduct field studies of the PCB-contaminated sediment problem. The final EIS should indicate that such studies will be undertaken in cooperation with the DNR.

1. Text of paragraph 2.2.5 has been modified as per comment.

2. Text of paragraph 4.7.3 has been modified as per comment.

3. Resampling of the harbor by the USEPA has been scheduled for October 1977. When the results of the USEPA resampling are available, the Chicago District intends to contact interested Federal, State and local water quality agencies, if necessary, to determine if any changes in the Chicago District's dredging/disposal methods or USEPA approved water quality monitoring plan are warranted.

Section 4.1.1 on page 4-1 describes environmental impact duration as temporary, short-term, and long-term. A short-term impact is experienced for a period of days following cessation of certain activities; a long-term impact is experienced over a period of years. The draft statement indicates that Bay Beach Park will experience a short-term low-magnitude adverse aesthetic impact due to the presence and operation of the confined disposal facility, as stated in Section 4.7.6 on page 4-11. Since it will take several years to fill the confined disposal facility to its designed capacity of sediments, we believe that the impact of the presence and operation of this facility would be more accurately described as having a long-term duration. Furthermore, determining the magnitude of this impact upon park users is a subjective decision which depends largely upon the expectations of the park users themselves.

Sincerely yours,

David L. Jervis
Regional Environmental
Officer

4. Text of paragraph 4.7.6 has been modified as per comment.

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS)
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

24 AUG 1977

Colonel Andrew C. Remson, Jr.
District Engineer
Chicago District, Corps of Engineers
Department of the Army
219 South Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

This is in response to your letter of 8 July 1977 concerning a draft environmental impact statement relating to the Federal operation, maintenance and dredged material disposal activities at Green Bay Harbor, Brown County, Wisconsin.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. The Coast Guard commented as follows:

"Paragraph 4. 2. 5 should be clarified regarding placement of navigational aids by the Coast Guard, i. e., whether they are to be placed on the diked disposal areas, vessels involved in the project, etc. In addition the statement should describe how placement of aids to navigation will mitigate hazards arising from the project.

"The Commander, Ninth Coast Guard District (obr) will need to evaluate the causeway depicted in Figure 1-2, p. 1-5, when plans for its construction are developed."

The Department of Transportation has no other comments to offer nor do we have any objection to this project. The final statement, however, should address the concerns of the Coast Guard.

The opportunity to review this draft statement is appreciated.

Sincerely,

F. P. SCHUBERT
Captain, U.S. Coast Guard
Director, Marine Environment and Systems
By Direction of the Secretary

1. Text of paragraph 4.2.5 has been modified.

2. Concur. However, since this structure is not covered in this statement, it has been removed from Figure 1-2.

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

AUG 2 6 1977

Colonel Andrew C. Remson, Jr.
District Engineer
U. S. Army Engineer District, Chicago
219 South Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

We have completed our review of the Draft Environmental Impact Statement (EIS) for Operation, Maintenance and Dredge Material Disposal at Green Bay Harbor, Wisconsin. Your letter of July 8, 1977, requested our views and comments on the proposed confined disposal facility (CDF), and the dredging operations at Green Bay Harbor. Our Agency has been involved in the site selection for the proposed CDF and we do not have any major comments in regard to this action. The following comments pertain to the normal maintenance dredging operations and the capacity of the CDF.

9-11

The EIS has indicated the majority of the dredging will be by the use of a hopper dredge. We have previously commented on other impact statements in regard to the overflow from the hopper dredges. Your response has been that to achieve an economic load, overflow is required. This procedure is especially true when long hauling distances are involved to the CDFs. Since Green Bay Harbor has its own CDF, the argument in favor of the economic loading does not appear as great. Furthermore, since the bottom sediments have not been analyzed for polychlorinated byphenols (PCB's), we recommend overflows from the hopper dredges not be permitted. A resampling of the harbor is planned for October 1977, and will include an analysis for pesticides and PCB's.

The EIS has indicated portions of the authorized maintenance channel are not dredged due to inactivity in the area. It was also indicated that if a need arises, these channels will be dredged. The EIS should indicate how much material would have to be dredged from these channels and whether or not the proposed CDF has adequate capacity to receive this additional material.

1. It is now the Chicago District's policy to not allow a hopper dredge to pump past overflow in cases where the material to be dredged is seriously contaminated with mercury, arsenic, or PCB's. When the analysis of the October 1977 resampling is available, the Chicago District if necessary, will contact the USEPA and other interested agencies, to determine future dredging procedures at Green Bay Harbor.

2. The Confined disposal facility has been designed to hold only dredged material from the active portions of the navigation channel as described in paragraph 1.4.1. If dredging of an inactive portion is needed, alternative disposal methods within the restrictions of USEPA disposal requirements will be developed.

The future plans for the CDF, once it is filled, have not been determined. There are plans to make the CDF a wildlife area and develop a small boat harbor adjacent to the CDF. Additional information in regard to the time frame for the small boat harbor and the firmness of the plans should be provided.

Based upon the information provided in the EIS, we have no objections to the projects implementation. We have rated the project as LO (lack of objections).

Since we have requested additional information, we have classified the EIS as category 2 (additional information necessary). The date and classification of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on other agencies' projects.

We appreciate the opportunity to review this Draft EIS. When the Final EIS is filed with the Council on Environmental Quality, please forward two copies to us. If you have any questions in regard to our comments, contact Mr. William D. Franz at 353-2307.

Sincerely yours,

9-12

Ronald L. Mustard

Ronald L. Mustard
Chief
Federal Activities Section

3. As stated in paragraph 1.5.7, the establishment of the filled confined disposal facility as a wildlife sanctuary or part of a small-boat harbor is not a part of the proposed action considered in this statement. The proposed plan and time frame for the small-boat harbor will be discussed in a separate report accompanied by a separate EIS. The plans for future use of the confined disposal facility have been included in this statement only as a means of showing the local sponsor's proposal to satisfy subsection (f) of Public Law 91-611.

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

SEP 8 1977

Colonel Andrew C. Remson, Jr.
District Engineer
U.S. Army Engineer District, Chicago
219 South Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

We recently forwarded to you our comments on the Draft Environmental Impact Statement (EIS) for the Proposed Confined Disposal Facility and Operation and Maintenance Dredging at Green Bay Harbor, Wisconsin. These comments indicated we had no objections to the project as planned. However, there has been an oversight on our part in regard to our review in that our Water Planning Section has not reviewed this Draft EIS. Therefore, we are requesting an extension of 30 days in order for us to make additional comments through their review.

9-13

We are also requesting that the Fox Valley Water Quality Planning Agency be granted the opportunity to review this Draft EIS. Since this is the 208 Planning Agency for Fox Valley River Basin, we believe their knowledge and expertise in regard to water quality impacts should be sought. We have taken the liberty of providing this agency a copy of the Draft EIS and we request that they be allowed until October 1, 1977 for their review.

If you have any questions in regard to our request, please contact Mr. William D. Franz at 353-2307.

Sincerely yours,

Christopher M. Timm
Director
Surveillance & Analysis Division

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

SEP 27 1977

Colonel Andrew C. Remson, Jr.
District Engineer
U.S. Army Engineer District, Chicago
219 South Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

Reference is made to our letter to your office dated September 8, 1977, concerning the Draft Environmental Impact Statement (EIS) for the Proposed Confined Disposal Facility and Operation and Maintenance Dredging at Green Bay, Wisconsin. At that time we requested an extension in time to provide additional comments on the proposed dredging. We have now completed our review and add the following concerns to those expressed in our August 26, 1977, comment letter on the Draft EIS.

9-14 The Draft EIS should note the close proximity of the proposed disposal area to Bay Beach Park and address the impact this could have on potential recreation. Although beaches on Green Bay have been closed to swimming for a long time, EPA, the State of Wisconsin, and local planning entities are working toward improving water quality in the lower Fox River and Green Bay such that swimming at the beaches will again be possible. The Fox River has shown considerable improvement over the last several years in response to pollution control efforts by industries and municipalities. It is important that the proposed project not present an obstacle to achieving water quality. Also, maps within the EIS should show the location of Bay Beach Park.

It is implied in Section 1.5.7 that the construction of this spoils island is significant to the proposed small boat harbor. Construction of the small boat harbor will involve additional environmental impacts that will need to be evaluated. Consequently, the construction and use of this site for dredge spoils disposal should be delayed until completion of the EIS for the proposed small boat harbor.

1. The proximity of Bay Beach Park to the proposed action is noted in paragraph 2.2.5. The impact upon potential recreation from the presence of the confined disposal facility is noted in 4.7.3. The proposed project, since it follows U.S. EPA requirements and confines dredged material from Green Bay Harbor that is unsuitable for open-water disposal, will improve the existing water quality of lower Green Bay. Figures 1-1 and 1-2 have been modified to show the location of Bay Beach Park.

2. As stated in paragraph 1.5.7, the construction of a small-boat harbor is <u>not</u> a part of the proposed action considered in this report. We agree that the construction of a small-boat harbor will involve additional environmental impacts and the Chicago District (as noted in paragraph 1.5.7) intends to prepare a separate feasibility report and EIS for the small-boat harbor. Mention of a proposed small-boat harbor adjacent to the confined disposal facility has been made in this statement only to show the local sponsor's proposed future use of the filled facility. Consequently, since the Chicago District has noted in this statement that the operation, maintenance, and dredged material disposal at Green Bay Harbor is a separate action from the proposed construction of a small-boat harbor at Green Bay, Wisconsin, we do not concur that construction and use of the confined disposal facility should be delayed until completion of an EIS for the proposed small-boat harbor.

Several references are made to possible odor problems. Section 1.7.2 states that appropriate measures will be implemented to modify or eliminate odors. The types of mitigative measures that will be taken in the event the odor problem is serious should be determined.

Section 4.6.4 indicates that the COE is currently conducting an investigation of the water circulation patterns near the proposed site. The results of this study should be known before a Final EIS is complete. Any significant change in circulation patterns and attendant changes in sedimentation should be evaluated before project construction.

We appreciate the opportunity to provide these additional comments. If you have any questions regarding our concerns, please contact Mr. William D. Franz at 353-2307.

Sincerely yours,

Barbara J. Taylor for

Ronald L. Mustard
Acting Chief,
Environmental Review Section

3. Text of paragraph 1.7.2 has been modified as per comment.

4. The Chicago District has completed an assessment of the water circulation patterns near the confined disposal facility site. The text of paragraph 4.6.4 has been modified to indicate that the assessment showed no significant degradation of water quality in lower Green Bay due to the presence of the proposed confined disposal facility.

THE STATE HISTORICAL
SOCIETY OF WISCONSIN
816 STATE STREET / MADISON, WISCONSIN 53706

July 21, 1977

Colonel Andrew C. Remson, Jr.
Corps of Engineers, District Engineer
Chicago District, Corps of Engineers
219 South Dearborn Street
Chicago, Illinois 60604

SHSW: 0438-76
RE: NCCPD-ER
Green Bay Harbor
maintenance

Dear Colonel Remson:

We have reviewed the above referenced project pursuant to the provisions of the National Historic Preservation Act (PL 89-665), as amended), Executive Order on the Protection and Enhancement of the Cultural Environment (EO 11593), and the Procedures for the Protection of Historic and Cultural Properties (36 CFR 800).

There are no sites listed on the National Register of Historic Places that would be affected by this project. Furthermore, we are not aware of any other archeological, architectural or historical sites which would be eligible for inclusion on the National Register and likely to be affected by this project.

However, if during the course of this project any materials or features of archeological, architectural and/or historical significance are encountered, please contact Mr. Richard W. Dexter (608/262-2732) in the Historic Preservation Division immediately.

Sincerely,

Richard A. Erney
State Historic Preservation Officer

By Jeff Dean
State Preservation Planner

RAE:jdd

1. Thank you for your review. Text of paragraph 1.7.9 has been modified as per comment.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Anthony S. Earl
Secretary

BOX 7921
MADISON, WISCONSIN 53707

September 19, 1977

IN REPLY REFER TO: 1600

Colonel Andrew C. Remson, Jr.
District Engineer
Chicago District, Corps of Engineers
219 South Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

Re: Draft Environmental Impact Statement for Operation, Maintenance, and Dredged Material Disposal at Green Bay Harbor, Brown County, Wisconsin

We have completed our review of the subject document and offer these comments.

9-17

Page 1-12, section 1.7.2 - It is stated that objectionable odors would be eliminated or controlled. The final EIS should indicate how the odor associated with dredge spoil disposal, which is presently evident in the vicinity of the Bayport site, would be controlled at the proposed island site.

Page 1-13, section 1.7.4 - The method of dredging which has typically been employed at Green Bay Harbor in the past does not "prevent spillage of oils and dredged materials" as stated here. The Hopper Dredge Markham, with its overflow pipe discharging suspended sediments on each run, does not "minimize the effects of dredging...operations on water quality" (1.7.5). The discussion in these two sections should be changed accordingly, and operational modifications which would eliminate this overflow problem should be implemented for all future maintenance activities in Green Bay Harbor.

1. Text of paragraph 1.7.2 has been modified as per comment.

2. It is the intention of the Chicago District to meet the stipulations of paragraphs 1.7.4 and 1.7.5 during future dredging operations at Green Bay Harbor. Normal hopper dredge operating procedures include some overflow of suspended dredged material in order to obtain an economical load of sediments in the on-board hoppers. In the case of unpolluted dredged material, overflow temporarily increases turbidity with no long-term impacts. However, in the case of polluted dredged materials, overflow may degrade water quality. It is now the policy of the Chicago District to not allow a hopper dredge to pump past overflow in cases where the material to be dredged is seriously contaminated with mercury, arsenic, or PCB's. When the analysis of the USEPA's October 1977 resampling of sediments in Green Bay Harbor is available, the Chicago District will contact the Wisconsin DNR, the USEPA and other interested agencies, if necessary, to determine future dredging procedures for Green Bay Harbor.

Page 2-11, section 2.1.27 - Recent reports reveal that the habitat conditions in lower Green Bay have improved somewhat in the past several years. As the water quality gradually continues to improve, the re-establishment of a more diverse fishery, including sport species, can be expected.

Page 2-14, section 2.2.4 - The description of existing boating facilities should include the new municipal boat ramp located near the proposed disposal site which receives heavy use.

Page 2-21, section 2.3.1 - The annual tonnage figure given is apparently incorrect in light of the figures presented in section 2.2.3.

Page 4.4.9 - If high levels of fecal coliform are considered a possiblity, the Corps should evaluate mitigation measures with the "appropriate public health agencies" prior to the initiation of dredging rather than after the problem arises.

Page 6-8, section 6.8.4.(7) - It is doubtful that shorebird nesting and recreational boating are compatible uses for this alternate island proposal.

In general, this draft EIS is much improved over many of those previously prepared by the Chicago District for the dredged material disposal program. A primary reason for the improvement is the inclusion of site specific environmental data and analysis; information which has been sorely lacking in the past. The early coordination with the Department which occurred prior to completion of the draft EIS has proven to be a helpful and constructive element of the Corp's EIS preparation process, and we urge that it continue to be utilized to the fullest possible extent.

One very important aspect of the proposed project which is not adequately described or evaluated is the potential effect of dredging and dredge spoil disposal on the PCB's known to be contained in the river and bay sediments in the areas to be dredged. In order that an appropriate monitoring program and disposal strategy may be developed for these sediments, it is suggested that a meeting involving the Department, EPA and the Corps be held in the near future.

We thank you for the opportunity to review this impact statement and look forward to continued contact on this matter.

Sincerely,
Bureau of Environmental Impact

James R. Huntoon

James R. Huntoon
Director

3. Text of paragraph 2.1.27 has been modified as per comment.

4. Text of paragraph 2.2.4 has been modified as per comment.

5. Text of paragraph 2.3.1 has been modified as per comment.

6. Text of paragraph 4.4.9 has been modified as no mitigative measure short of suspending dredging would probably be effective.

7. Text of paragraph 6.8.4 (7) has been modified as per comment.

8. The Chicago District appreciates the cooperation offered by the Madison and Green Bay offices of the Wisconsin Department of Natural Resources.

9. Concur. If necessary, the Chicago District will meet with the Wisconsin DNR, the USEPA and other interested agencies after the USEPA October 1977 sediment resampling analysis for Green Bay Harbor is available. This meeting will aid in determining future dredging procedures at Green Bay.

State of Wisconsin \ DEPARTMENT OF TRANSPORTATION

DIVISION OF PLANNING
4802 Sheboygan Avenue
P. O. Box 7913
Madison, WI 53707

August 24, 1977

Colonel Andrew C. Remson, Jr.
District Engineer
Department of the Army
Chicago District, Corps of Engineers
219 South Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

Re: Draft Environmental Impact Statement relating to Operation, Maintenance, and Dredged Material Disposal at Green Bay Harbor, Wisconsin

We have reviewed the above-noted Draft Environmental Impact Statement (EIS) and have no comments.

Thank you for the opportunity to review this Draft EIS.

Sincerely,

T. J. Hart
Administrator

1. Thank you for your review. No response necessary.

GREEN BAY BROWN COUNTY PLANNING COMMISSION

497-3633

100 NORTH JEFFERSON STREET
GREEN BAY, WISCONSIN
-54301-

August 29, 1977

Colonel Andrew C. Remson, Jr.
District Engineer
U.S. Corps of Engineers
219 South Dearborn
Chicago, IL 60606

Dear Colonel Remson:

This letter is in response to your letter and Draft Environmental Impact Statement, July, 1977, related to the Operation Maintenance and Dredged Material Disposal at Green Bay Harbor, Wisconsin.

The Green Bay and Brown County Planning Commissions have both fully supported the continued maintenance of our harbor, including the disposal of the dredged material in the present Bay Port facility, and the construction and use of a new island containment disposal facility north and west of Bay Beach Park. Our Commissions are particularly supportive of the new near-shore island concept in that it will be an excellent addition to our shore from a conservation and recreational standpoint. The future possibility of connecting the island to shore with a public pedestrian causeway adds to our open space dimension of passive recreation in combination with portions that should be set apart for natural conservation purposes. The possibility of a small boat harbor being designed in combination with the island in the future is an excellent opportunity and will save the public considerable capital investment in the dual purpose if such is subsequently approved.

The completion of the diked disposal area in Bay Port, a new island near Bay Beach Park and continued maintenance dredging in the Fox River Channel seems to provide the greatest overall benefit to most interests, and is complementary with the goals of the adopted Brown County Comprehensive Plan.

Some specific corrections and changes are attached that should be brought to your attention. Thank you for affording us this review and your continued cooperation with local interests.

Sincerely,

B.F. Paruleski, AIP
Executive Director

BFP:jma

Enclosure

CITY PLANNING - COUNTY PLANNING - URBAN RENEWAL - LOCAL ASSISTANCE

DREDGED MATERIAL DISPOSAL -- COMMENTS

Page	Paragraph	Comment	
i	2nd Paragraph	26A should be 40A	
1-7		..."Wildlife Sanctuary with a small portion of the island fenced off and available to wildlife viewers on a limited access basis."	1. Text of paragraph 1.5.7 has been modified as per comment.
		The legislative lakebed grant is for "conservation and/or recreational use." Should not limit statement to small portion fenced off. The plan for the island may recommend broader areas for passive recreation without fencing, but within reasonable use as planned for the U.S. Fish and Wildlife Service and the Wisconsin Department of Natural Resources.	2. Text of paragraph 1.5.7 has been modified as per comment.
2-15	1st Paragraph	There are several public and private boat ramp facilities not mentioned, including one by the City of Green Bay on the east bank of the Fox River between the Green Bay Yacht Club and Green Bay Metropolitan Sewerage Distrist on East Shore Drive.	3. Text of paragraph 2.2.4 has been modified as per comment.
		The one in the Brown County Fairgrounds is county operated instead of city.	
2-16	1st Paragraph	Insert City of Green Bay Boat Launching Ramp between Green Bay Metropolitan Sewerage District and the Green Bay Yacht Club facilities.	4. Text of paragraph 2.2.8 has been modified as per comment.
2-18	2nd Paragraph	Major local City streets on east side are Monroe Avenue, Washington Street, and Quincy Street instead of Jefferson Street. Riverside Drive is correct in the Town of Allouez.	5. Text of paragraph 2.2.16 has been modified as per comment.
4-8	4th Paragraph	26A should be 40A as the basin area.	6. Text of paragraph 4.6.2 has been modified as per comment.
4-10	2nd Paragraph	...access viewing [illegible] proposed. Viewing "areas" might be better as platform is limiting the design plan.	7. Text of paragraph 4.7.3 has been modified as per comment.

FOX VALLEY
WATER QUALITY PLANNING AGENCY
1919 AMERICAN COURT • NEENAH, WI 54956 • (414) 739-5586

September 19, 1977

Colonel Andrew C. Remson, Jr.
District Engineer
U.S. Army Engineer District, Chicago
219 S. Dearborn St.
Chicago, Illinois 60604

Dear Colonel Remson:

Fox Valley Water Quality Planning Agency offers the following comments on the Draft Environmental Impact Statement relating to Operation, Maintenence, and Dredge Material Disposal at Green Bay Harbor Wisconsin. It is hoped that you will receive these comments in time to consider utilizing them in any revisions of the Draft Statement. To expedite this, please feel free to call for clarifying discussions of any of the following points.

Our Agency looks forward to a continuing role in review of any of the USAE projects having impact on our 208 study area (from the water quality stand point) and would appreciate being included on your mailing list for these project review opportunities.

Sincerely,

William R. Elman
Executive Director

WRE/JL/et

enclosures:

c.c.

John Monfort Jr.
Jack Day
Jim Young
Don Theiler
Caroline Garber
Bob Ruesink
Bud Paruleski
Al Schoen
Linda Vogen
George Mackin
Hank Braedel
Shirley Mitchell
Green Bay Harbor Commission

GEORGE N. SINGSTOCK, Chairman • JOHN MONFORT, Vice-Chairman • WILLIAM R. ELMAN, Executive Director

Fox Valley Water Quality Planning Agency Staff Comments
on the Green Bay Harbor Impact Statement

#1 On pp. 1-11 it is stated that for water effluent from the confined disposal site via the sand filter cells,

"A water quality monitoring plan for the facility has been developed by the Chicago District and will sample the facility area water quality before, during, and after disposal operations to monitor the effectiveness of the sand filter and island wall. This water quality monitoring program will include sampling of warranted physical, chemical, and biological parameters in coordination with the USEPA, the Wisconsin DNR and interested local agencies. Remedial action will be taken should the monitoring reveal any problems".

As an 'interested local agency' FVWQPA recommends that the following water quality parameters (as a minimum) be routinely monitored at all outflow points from the confined site.

Total Phosphorus
Total Suspended Solids
Total PCB
cadmium, mercury, arsenic

Ambient levels of these same parameters in the waters surrounding the proposed site should be determined prior to active use of the confined site and again at several occasions throughout the active use of the site for spoil disposal. This is regarded as a 'short list' of desirable parameters useful for determining environmental impacts and any others added to the list would be desirable from our standpoint.

#2 To enable routine monitoring of all outflow points of supernatant or leachate waters, FVWQPA recommends the following additional practices.

An inert traceable dye (perhaps a Rhodamine or Fluorescein type) should be maintained in visible or measurable concentrations in any standing water within the confinement facility once the liquid or spoil level equals or exceeds lake level (I.G.L.D.). This practice should be extended as long as spoils are exposed to precipitation or until it is certain that no leachates are escaping unmonitored.

Thus, an inexpensive and instantaneous monitoring of unexpected leaks or the amount of outflow at the sand cells could be provided. (Note it may be possible to correlate effuent dye concentration to any of the conservative soluable compounds otherwise being tested if dye levels are maintained at a precise level within the facility) Grab samples of any leaks or high outflows thus detected could be taken to a laboratory for convenient and less hurried analyses while mitigati steps are being taken.

1. The Chicago District's water quality monitoring plan has been approved by Region V of the USEPA. The parameters of total suspended solids, total PCB's and mercury will definitly be sampled. The parameters of total phosphorus, cadmium, and arsenic will be monitored if the October 1977 resampling of sediments in Green Bay Harbor by the USEPA indicates such parameters are warranted. As stated in paragraph 1.5.9, the Chicago District will sample water quality before, during, and after disposal operations. As suggested by your agency.

2. Past experience at other Chicago District confined disposal facilities has not shown any effluent discharge from other than the sand filter cells. However, the inert traceable dye proposal is interesting. We would like to discuss this proposal with the FVWQPA but we question the effectiveness of this technique is such a large (55 acre) confined disposal facility.

#3 The final Impact Statement could well list the potential mitigative measures so that concerned parties may be aware of the opportunities that exist to deal with undesirable effluents from the disposal facility. It is conceivable that proposed mitigative measures may have environmental impacts of their own and parties reviewing the Draft may wish to state preferences or point out alternative measures that are available.

If it is not possible to outline available remedial measures and describe their effectiveness in halting negative impacts on water quality then it is necessary that the USAE conduct sufficient research with pilot projects, duplicating the environmental conditions and engineering specifications for the proposed full scale project. This would assure that remedial measures are available that can correct any expected problems. In other words, it would be useful to know what the worst that can be expected is before designing any contingency plans. Pilot tests, such as dewatering a composite sample of Green Bay sediments from the project area and measuring the contaminants in the leached waters, could be easily conducted for minimum costs and at no delay to the project schedule. By this means it would be possible to anticipate water quality impacts and plan to remedy any measurable impacts in advance rather than after they have occured. With existing information, it is not possible to choose detection limits or satisfactory error limits for monitoring the effluents from the disposal site!

#4 On pp 4-5 section 4. 4.5 discussion is made of the impact of dredging on the trophic condition of the Green Bay.

> "However, despite the temporary depressing effect of a turbidity cloud, sediment nutrients released by dredging operations may encourage both phytoplankton and zooplankton growth, especially algae blooms, in Lower Green Bay after the temporary turbidity clouds disperse. If algae blooms occur, as they frequently do in Lower Green Bay, an adverse impact may be felt in the aquatic ecosystem of the Bay because they can create an imbalance in the food chain. Increased algae growth can ultimately lead to low dissolved oxygen levels which are detrimental to aquatic life. However, when the algae bloom possibly resulting from dredging Green Bay Harbor is compared to the natural algae bloom which occurs annually in Lower Green Bay (Patterson et al. 1975) any bloom resulting from dredging becomes a very short-term, low-magnitude impact".

While the above statements, especially the last sentence, may have been appropriate in the past, recent studies and drastically changing conditions of water quality do not lend credence to this analysis. Specifically, an algae bloom does not result from a given pollution source per. se., but rather is encouraged by that source. Eutrophication in Green Bay is an advanced rate of a natural process that is above normal due to many sources of pollution making high contributions of Phosphorus, Nitrogen, etc.. What is pertinent to this statement (4.4.5) is that

3. Specific potential mitigative measures for failure of the confined disposal facility to operate effectively are not mentioned in the EIS as they will be designed on a case by case basis. None of the Chicago District's other confined disposal facilities have failed and we expect no failure of the confined disposal facility covered in this statement. The Green Bay Harbor confined disposal facility will be inspected for structual failure on a regular basis so that potential problems can be eliminated.

The U.S. Army Engineer Waterway Experiment Station in Vicksburg, Mississippi, has conducted extensive research on confined disposal facilities as a part of the Dredged Material Research Program. This research has been used in the design of the Green Bay Harbor confined disposal facility. Sediments in Green Bay Harbor have been sampled by the USEPA and other agencies and this information has also been used in the design of the degree of filtering effectiveness needed at the Green Bay Harbor confined disposal facility.

4. Text of paragraph 4.4.5 has been modified as per comment.

once advanced waste treatment for point sources is on line and as work on getting proper land management practices implemented succeeds, the pollution arising from dredging could become an important source of growth limiting nutrients to the Bay waters on a continuing basis.

The FVWQPA's Trophic Status Study of the Green Bay, to be completed in November of 1977, will address this potential. Until more quantitative information is available, the analysis cited is inappropriate.

#5 In paragraph 4.7.2 it is stated that (at the disposal site) a filtration device will be incorporated to remove suspended solids and, ostensibly, polluted material which may sorbed to or associated with the solids suspended in effluent waters.

> "A cellular sand filter will be incorporated into the walls of the facility (Figure 1-2) to filter any effluent from the facility before discharge to Green Bay".

While this function will almost certainly be served by the design which is presented, there is some question as to its effectiveness in removing some kinds of toxic substances. While PCB materials may be colloidal in nature and would be removed by a sand filter, freezing and consequent thawing of the sand filter, however, could release PCBs from the colloidal association and allow high concentrations to be released into the Bay. Laboratory studies to address this potential would be advisable. If the potential is great, then removal of the sand filter to a landfill would be advisable prior to freezing.

#6 On pp. 4-5 section 4.4.6. discussion is made of the effects of toxic substances on aquatic life. While the discussion is reasonable for the subjects presented, an additional perspective should be introduced. The most important effect of re-introduced toxic materials from the lakebed sediments, via any mechanism, is on the rate of biomagnifications to fish species suitable for human consumption. One important vector of biomagnification which could be influenced significantly by dredging is renewed availability of toxic substances to benthic macro-invertebrates dwelling over a wide area of lakebed sediments.

It is well known that benthic macro-invertebrates are an important food source to certain fish species. Toxic sedimentary materials arriving from the Lower Fox River and settling out in the delta region of the River's mouth could, via dredging in this area, be resuspended and distributed thinly across a greater area of Bay sediments. Hence, toxic material would be distributed over a greater area and on the sediment surface where they are proximate to the life stages of macro-invertebrates, thereby influencing the overall rate of biomagnification to feeding fish..

5. The Chicago District does not believe that the freeze/thaw cycle will impare the effectiveness of the cellular sand filter to prevent PCB's from entering lower Green Bay. As shown on Figure 1-5, there is an adjustable wier incorporated into the disposal side of the cellular sand filter to limit the amount of sediment entering the filter. Therefore, since the PCB's will tend to remain in colloidal suspension with the sediments and the wier will only allow a small amount of sediment to be trapped in the filter, the freeze/thaw cycle should have no significant effect on the sand filter's capability to prevent PCB's from entering lower Green Bay.

6. Text of paragraph 4.4.6 has been modified as per comment. Additional sediment analysis has been incorporated into Appendix B of the FEIS. However, it should be pointed out that the U.S. Army Engineer Waterway Experiment Station samplings were not in the channels of Green Bay Harbor but rather to the east of the mouth of the Fox River in lower Green Bay. As stated in paragraph 1.5.9, the Chicago District intends to monitor all warranted water quality parameters as suggested by the FVWQPA in coordination with the USEPA, the Wisconsin DNR and interested local agencies.

The USEPA will resample the sediments of Green Bay Harbor in October 1977. When the analysis of this resampling is available, the Chicago District will contact the FVWQPA, if necessary, to discuss the results of the analysis and possible ramifications.

This problem of course, would dissipate as some toxic materials are restrained from the watercourse by waste treatment and toxic substance use regulation. Some toxic materials arriving principally from non-point sources of pollution are much more ubiquitous, however, and will continue to contribute to the process cited for a long while. Similarly, a 'reserve' of toxic sedimentary material may be slowly shifting down the river bed of the Lower Fox, having been deposited there from years gone by. PCB's are a notable example of this type of material as extremely high concentrations have been detected by WDNR studies of sediments from Little Lake Butte des Morts and some downstream areas. Studies conducted specifically for the U.S. Army Corps of Engineers on the sediments of the Green Bay Harbor are available (see appendix to comments) and should definitely be cited in the Impact Statement. Pertinent data from that laboratory study should be included in the Appendix of the Impact Statement to allow reviewing parties the opportunity to consider potential impacts from the standpoint of the processes speculated upon in this comment (#6).

A program of monitoring ambient sediment surface PCB and heavy metal concentrations before, during, and after project dredging would easily reveal if there is reason for future concern. Again, such an investigation would not delay the proposed project but rather would make concerned parties aware of potential impacts and needed mitigative measures, and provide impetus for study of the initial sources of toxics within the sediments. These studies would eventually lead to pollution control measures that would make dredging in the future less expensive and of lesser environmental impact.

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APPENDIX A

LETTERS OF PRE-DRAFT COORDINATION

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

OCT 6 1976

Colonel Andrew C. Remson, Jr.
District Engineer
U.S. Corps of Engineers, Chicago
219 S. Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

Your letter of August 26, 1976, requested background data for the proposed maintenance work at Green Bay Harbor. We understand this information will be used in preparing a Draft Environmental Impact Statement.

Our Agency has completed the funding of a grant for the construction of a regional wastewater treatment facility. This plant has recently gone into operation and has a total design capacity of 52 million gallons per day. Further area wastewater treatment studies and allocation procedures are being carried out by the 208 Planning Agency. Information on the plans and goals can be obtained from Mr. Bill Elman, Executive Director, Fox Valley Water Quality Planning Agency, 1919 Amercian Court, Neenah, Wisconsin 54456. Mr. Elman can be contacted by phone at 414-739-5586. We have also provided you a copy of the Fox River Model which indicates all of the major point source dischargers at Green Bay. There should be little impact upon drinking water intake supply since Green Bay obtains its water from Lake Michigan.

The air quality at Green Bay is in compliance with the State Implementation Plan. There are no areas of non-attainment nor is there a transportation control plan for the metropolitan area.

The Federal Highway Administration is funding several highway improvements in the Green Bay area. However, none of these projects, with the exception of Tower Drive, are in the harbor area. If additional information is desired, we suggest you contact Mr. John O. Hibbs, Division Administrator, Federal Highway Administration, P. O. Box 5028, Madison, Wisconsin 53701.

Thank you for providing us with the opportunity to provide this background data. If you have any further questions, please contact Mr. Bill Franz at 353-2307.

Sincerely yours,

Gary A. Williams

Gary A. Williams
Chief,
Environmental Review Section

Attachment

THE STATE HISTORICAL SOCIETY OF WISCONSIN

816 STATE STREET / MADISON, WISCONSIN 53706 / JAMES MORTON SMITH, DIRECTOR

State Historic Preservation Office

July 30, 1976

Colonel Andrew C. Remson, Jr.
District Engineer
Chicago District, Corps of Engineers
219 South Dearborn Street
Chicago, Illinois 60604

SHSW 0438-76

Dear Colonel Remson:

Reference your letter of July 21, 1976 concerning a Draft Environmental Impact Statement for maintenance activities to be conducted after 1977 at Green Bay Harbor, City of Green Bay, Brown County, Wisconsin (NCCPD-ER).

There are no sites listed on the National Register of Historic Places that would be adversely affected by this project. Furthermore, there are no sites known to us of archeological, architectural, or historical significance in the project area that would be eligible for inclusion on the National Register of Historic Places.

No archeological or historical reconnaissance survey will be necessary.

We are informing the local historical society of this project and should they inform us of a site or building in the project area that we are unaware of, we will contact you immediately.

Sincerely,

Richard A. Erney

Richard A. Erney
Acting State Historic
Preservation Officer

RAE:rdc
cc: Mrs. Dorothy Wittig
Brown County Historical Society

BROWN COUNTY BOARD OF HARBOR COMMISSIONERS
The PORT of GREEN BAY, WISCONSIN

COURTHOUSE
GREEN BAY, WISCONSIN 54301
TELEPHONE 414 / 437-3211

September 9, 1976

Col. Andrew C. Remson, Jr., District Engineer
Corps of Engineers
219 South Dearborn Street
Chicago, Illinois 60604

Dear Colonel Remson:

This is in response to your letter of August 26, 1976, regarding your preparation of a Draft Environmental Impact Statement with respect to harbor maintenance activities to be performed at Green Bay Harbor. You have asked that we comment on the plans to construct an island disposal facility.

The Board of Harbor Commissioners has had this matter under study for several years and has steadfastly recommended that the island site be constructed with a minimum of delay. The record will indicate that a previously chosen site was eliminated because of the objections of U. S. Fish and Wild Life Service and others.

The off-shore island site near Bay Beach Park has the full backing of this Board. During the discussions it has been brought out that the off-shore island could become an asset to the community as a wild-life refuge, a park or an extension of the marina being discussed as located on the shore opposite the island.

Too, we are not aware of any serious objections to the off-shore island site by environmentalists and conservationists, and the boating people have appeared strongly in favor of the island because it will be an important adjunct to the proposed marina.

We believe that the off-shore island offers the best possible solution to the disposal of dredged materials both on a short and long range plan.

Yours very truly,

Robert W. Barclay

Robert W. Barclay
Port Director

RWB:mz

"Gateway to the Great Seaway"

GREEN BAY BROWN COUNTY

PLANNING COMMISSION

TELEPHONE: 437-7611

100 NORTH JEFFERSON STREET
GREEN BAY, WISCONSIN
-54301-

September 7, 1976

Andrew C. Remson, Jr.
Colonel, Corps of Engineers
Chicago District
219 South Dearborn Street
Chicago, IL 60604

Dear Colonel Remson:

This is in response to your letter concerning the Corps of Engineers' environmental, social, and economic analysis of the proposed maintenance work at Green Bay Harbor.

As you are aware, both the Green Bay and Brown County Planning Commissions fully support the proposed maintenance work including the disposal of dredged material to finish off Project Bay Port Industrial Park and construction of an off-shore contained disposal facility north and west of Bay Beach Park. Of particular interest is the possible use of the containment site as an integral part of a future small boat harbor. Both the marina and industrial park have been identified in the land use elements of the Brown County Comprehensive Planning Program.

As for existing background or inventory data, I would like to make you aware of the following documents which may be obtained from this office:

1. Brown County Comprehensive Plan
2. Project Bay Port Plan and Environmental Assessment
3. Air Photos and Maps of Area
4. Bayshore Park Environmental Analysis
5. Water Pollution Investigation - Lower Green Bay and Lower Fox River (EPA)
6. Student EIS completed for Bay Beach Marina.

I might also suggest you contact the following persons or agencies:

1. Brown County Harbor Commission
   Mr. R. Barclay, Harbor Director
2. Green Bay City Engineers' Office
   Mr. Clyde Crabb, Public Works Director

3. Green Bay Metropolitan Sewerage District
   Mr. D. Martin, District Engineer-Manager

4. Lake Michigan District-Department of Natural Resources

5. Bay Lake Regional Planning Commission
   Mr. R. Bergman, Director

If I can be of any further assistance, please feel free to contact me.

Sincerely,

B.F. Paruleski, AIP
Executive Director

BFP:jmc

December 15, 1976

TO THE HONORABLE CHAIRMAN AND MEMBERS
OF THE BROWN COUNTY BOARD OF SUPERVISORS

Ladies and Gentlemen:

WHEREAS, the U.S. Army Corps of Engineers has proposed that a site in the Bay lying westerly of Bay Beach Park, as shown on the attached diagram, be designated as the disposal area for the depositing of spoils from dredging operations in the Green Bay Harbor; and

WHEREAS, an island of approximately 55 acres will be created on the site, which the Corps of Engineers is willing to turn over to Brown County for natural or recreational purposes if Brown County furnishes certain assurances of local cooperation; and

WHEREAS, it is the recommendation of the undersigned Brown County Planning Commission that Brown County approve the selection of the island site and provide the necessary assurances.

NOW, THEREFORE, BE IT RESOLVED, that the Brown County Board of Supervisors does hereby approve the plan of the U.S. Army Corps of Engineers to create an island in Green Bay lying westerly of Bay Beach Park as a disposal area for the depositing of spoils from dredging operations in the Green Bay Harbor.

BE IT FURTHER RESOLVED, that Brown County will:

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 damages caused by the negligence of the government and/or its contractors.

3. Maintain the facility after completion of its use for disposal purposes in a manner satisfactory to the Secretary of the Army.

Inc 2

4. Retain title to all lands, easements, and rights-of-way furnished by it pursuant to subparagraph 1 above, and that it will be conveyed to another party only after completion of the facility's use for disposal purposes and that after the transferee agrees in writing to use or maintain the facility in a manner which the Secretary of the Army determines to be satisfactory.

5. Provide for uniform and equitable treatment of persons displaced from their homes, businesses, or farms by federal or federally-assisted programs and to establish uniform and equitable land acquisition policies in compliance with the Uniform Relocation and Real Property Acquisition Policies Act of 1970 (PL 91-646), if applicable.

BE IT FURTHER RESOLVED, that the County Clerk be and is hereby authorized to sign an agreement on behalf of Brown County containing the above provisions.

Respectfully submitted,

BROWN COUNTY PLANNING COMMISSION

Approved by:

COUNTY EXECUTIVE

APPENDIX B

REPORT ON THE DEGREE OF POLLUTION OF BOTTOM SEDIMENTS

REPORT ON THE DEGREE OF POLLUTION OF BOTTOM SEDIMENTS IN THE FOX RIVER AND GREEN BAY
July 9, 1969

May, 1970

Federal Water Quality Administration
Great Lakes Region
Lake Michigan Basin Office

In accordance with an agreement between the Federal Water Quality Administration and the United States Army Corps of Engineers that the Federal Water Quality Administration would determine the degree of pollution in bottom sediments in harbors to be dredged by the Corps of Engineers, personnel of the Lake Michigan Basin Office sampled the Fox River and Green Bay navigation channel on July 9, 1969. The points sampled represent the entire Federal channel maintenance project. Color photographs were made of all samples observed. These photographs are on file at the Lake Michigan Basin Office.

Members of the sampling crew were:

Robert J. Bowden - Sanitary Engineer
William J. Degutis - Aquatic Sampler
Phillip Morris - " "
Daniel Chorowicki - Boat Operator

CONCLUSIONS

1. Sediments in the channel north of station GBAY 69-9 (Channel marker B 15) are moderately polluted sands.

2. Sediments in the channel between station GBAY 69-9 and the mouth of the Fox River are heavily polluted by the sewage treatment plant discharge.

3. Sediments in the Fox River from its mouth to the turning basin in DePere are heavily polluted by industrial wastes.

4. None of the sediments in this channel are suitable for disposal in the open waters of Green Bay or Lake Michigan.

DISCUSSION OF RESULTS

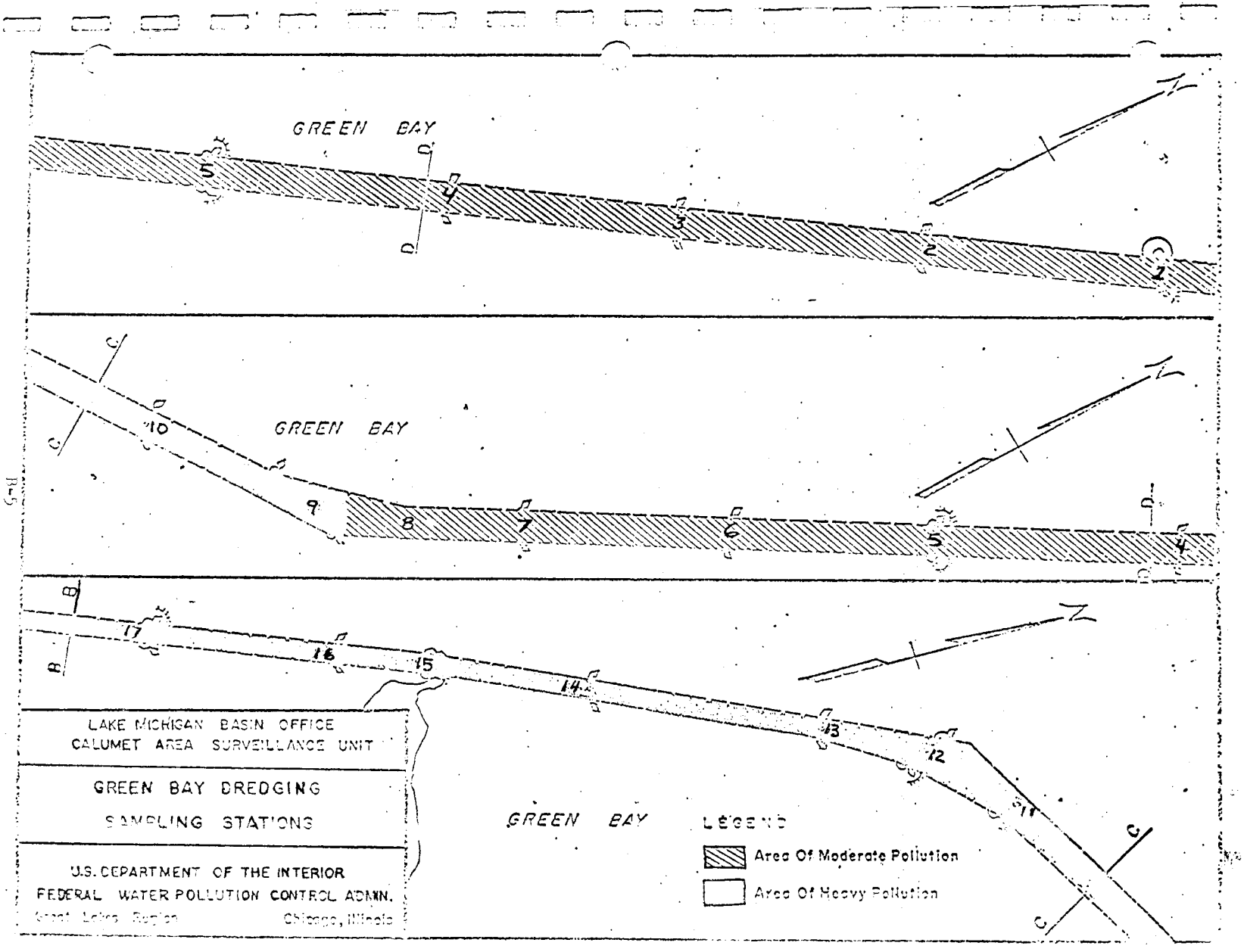
Sediments from station GBAY 69-1 thru GBAY 69-5 (See page 5) consisted of a reddish or dark brown sand. They had a sewage odor with snails and sludgeworms (See Table I). The results of chemical analysis of station GBAY 69-1 (See Table II) reveal that these sands have been effected by pollution. High concentrations of volatile solids and phosphorus indicate pollution from organic or domestic wastes. Most of the other parameters were moderately high with the exception of hexane solubles which was low. The sands in the area do support benthic life but are moderately polluted by organic material.

Stations GBAY 69-6 to GBAY 69-8 appear to be in a scour area. The hard red clay found is typical of the natural underlying strata of Green Bay.

A dark brown silt was found at station GBAY 69-9. Chemical analysis of this sample found high concentration of all parameters. The sediment in the area is heavily polluted. This silt appears to be typical of heavily polluted material in the river. All of the remaining samples that were analyzed consisted of silt and were heavily polluted. (Stations GBAY 69-18, GBAY 69-25 and GBAY 69-36, see map page 6).

With the exception of stations GBAY 69-12 and GBAY 69-17 which appear to be scoured all of the stations between GBAY 69-9 and GBAY 69-21 are effected by the Green Bay sewage treatment plant which discharges near the mouth of the river. Stations above GBAY 69-21 appear to be more affected by industrial wastes with chemical musty and earthy odors. Wood pulp was found at stations GBAY 69-38 and GBAY 69-39.

A previous study was made in the area on May 21, 1968. Samples were collected in the area between GBAY 69-33 and GBAY 69-36. All of those samples indicated heavy pollution.


GREEN BAY
GREEN BAY
GREEN BAY
LEGEND
Area Of Moderate Pollution
Area Of Heavy Pollution
LAKE MICHIGAN BASIN OFFICE
CALUMET AREA SURVEILLANCE UNIT
GREEN BAY DREDGING
SAMPLING STATIONS
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMIN.
Great Lakes Region
Chicago, Illinois

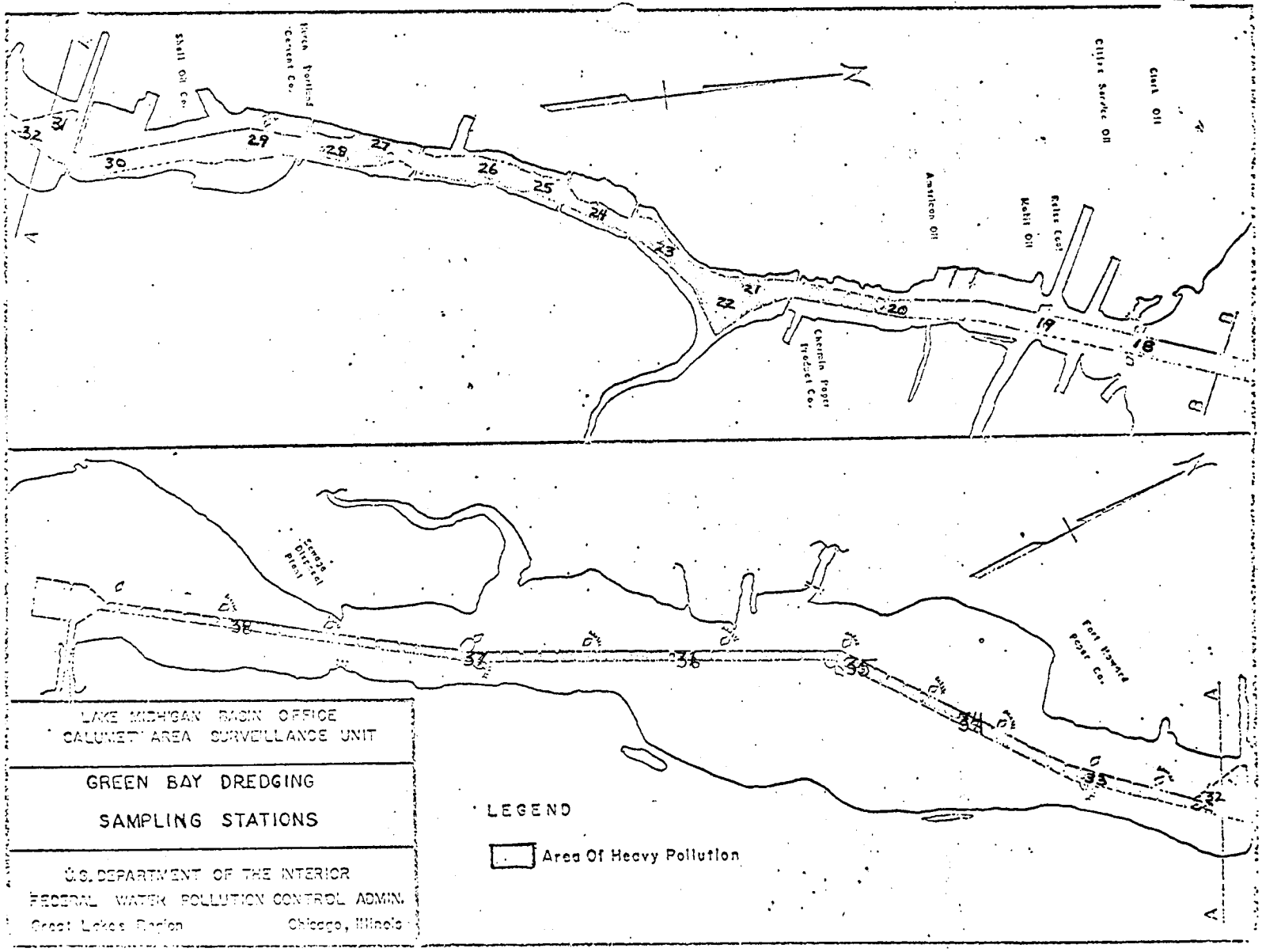

Shell Oil Co.
Lehigh Portland Cement Co.
Clifton Service Oil
Clark Oil
American Oil
Kohler Coal
Mobil Oil
Chemin Paper Products Co.
Sewage Disposal Plant
Fort Howard Paper Co.
LAKE MICHIGAN BASIN OFFICE
CALUMET AREA SURVEILLANCE UNIT
GREEN BAY DREDGING
SAMPLING STATIONS
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMIN.
Great Lakes Region
Chicago, Illinois
LEGEND
Area Of Heavy Pollution

TABLE 1

FIELD OBSERVATIONS OF BOTTOM SEDIMENTS
FOX RIVER-GREEN BAY
July 9, 1969

Sta GBAY 69-1	Depth 29 Feet Very fine dark brown sand with red clay and some gravel, sewage odor, large snail shells, sample retained.
Sta GBAY 69-2	Depth 28 feet Fine reddish brown sand, sewage odor, sludgeworms, snail shells.
Sta GBAY 69-3	Depth 27 feet Very fine reddish brown sand, sewage odor, bloodworm, few sludgeworms.
Sta GBAY 69-4	Depth 29 feet Very fine grey-brown sand, sewage odor, few sludgeworms.
Sta GBAY 69-5	Depth 28 feet Brown medium sand, slight sewage odor, few sludgeworms.
Sta GBAY 69-6	Depth 28 feet Hard red clay, no odor, no benthic life.
Sta GBAY 69-7	Depth 28 feet Hard red clay, no odor, no benthic life, no photograph.
Sta GBAY 69-8	Depth 28 feet Gravel and coarse sand, no odor, small snailshell.
Sta GBAY 69-9	Depth 28 feet Dark brown fine silty sand, sewage odor, sludgeworms, sample retained.
Sta GBAY 69-10	Depth 27.5 feet Hard red clay and dark brown silty sand, little odor, no benthic life.
Sta GBAY 69-11	Depth 30 feet Grey-brown sandy silt, sewage odor, sludgeworms.
Sta GBAY 69-12	Depth 32 feet Stiff red clay, no odor, no benthic life.
Sta GBAY 69-13	Depth 32 feet Hard red clay, grey sandy silt, strong sewage odor, sludgeworms.
Sta GBAY 69-14	Depth 31.5 feet Brown silt, sewage odor, sludgeworms.

TABLE 1 (cont.)

Sta GBAY 69-15	Depth 32 feet Dark brown silt, sewage odor, sludgeworms, detritus.
Sta GBAY 69-16	Depth 31 feet Grey silt, strong sewage odor, sludgeworms.
Sta GBAY 69-17	Depth 31 feet Red clay, no odor, no benthic life, no photograph.
Sta GBAY 69-18	Depth 30 feet Dark grey silt, sewage odor, no benthic life, sample retained.
Sta GBAY 69-19	Depth 28 feet Dark brown silt, strong sewage odor, no benthic life.
Sta GBAY 69-20	Depth 28.5 feet Grey silt, strong sewage odor, sludgeworms.
Sta GBAY 69-21	Depth 33 feet Grey-brown silt, sewage odor, large clam shells, fingernail clams, snails, sludgeworms, coal.
Sta GBAY 69-22	Depth 27 feet Grey-brown silt, strong musty odor, sludgeworms.
Sta GBAY 69-23	Depth 31.5 feet Dark brown fine sand, black gravel, earthy odor, large clamshells.
Sta GBAY 69-24	Depth 30 feet Stiff grey clay, coal, little odor, large clamshell, fingernail clamshell.
Sta GBAY 69-25	Depth 29 feet Grey silt, sewage odor, sludgeworms, sample retained.
Sta GBAY 69-26	Depth 32 feet Dark grey silt, earthy odor, few sludgeworms.
Sta GBAY 69-27	Depth 27 feet Light grey stiff clay, little odor, no benthic life.
Sta GBAY 69-28	Depth 32 feet Dark grey silt, little odor, few sludgeworms, detritus.
Sta GBAY 69-29	Depth 26 feet Dark grey-brown silt, earthy odor, sludgeworms.
Sta GBAY 69-30	Depth 30 feet Dark brown silt, earthy odor, sludgeworms.
Sta GBAY 69-31	Depth 20 feet Grey-brown silt, chemical odor, sludgeworms.

TABLE 1 (cont.)

Sta GBAY 69-32	Depth 24 feet Grey-brown silt, chemical odor, few sludgeworms, oil.
Sta GBAY 69-33	Depth 22 feet Dark brown silt, earthy odor, sludgeworms.
Sta GBAY 69-34	Depth 20 feet Dark brown silt, earthy odor, no benthic life, no photograph.
Sta GBAY 69-35	Depth 17 feet Dark brown silt, chemical odor, no benthic life.
Sta GBAY 69-36	Depth 22 feet Dark brown silt, chemical odor, no benthic life, sample retained.

TABLE II

RESULTS OF ANALYSIS OF BOTTOM SEDIMENTS
COLLECTED IN THE FOX RIVER AND GREEN BAY
July 9, 1969

	GBAY-69-1 mg/kg	GBAY 69-9 mg/kg	GBAY-69-18 mg/kg	GBAY 69-25 mg/kg	GBAY 69-36 mg/kg
% Total Solids	58.7	26.3	32.7	20.4	18.4
% Volatile Solids	9.8	15.3	12.4	20.2	22.3
Specific Gravity	1.5320	1.1676	1.2203	1.1180	1.1074
COD	44,985	170,625	195,145	136,720	279,260
Total Phosphorus	545	1,245	2,020	4,355	4,830
Ammonia Nitrogen	65	215	365	775	925
Organic Nitrogen	1,635	6,640	5,350	10,440	11,510
Oil and Grease*	995	5,910	8,215	11,115	10,200
Total Iron	7,020	14,450	13,335	15,065	15,995
Zinc	37	148	190	314	283
Lead	66	141	125	74	82

*** Hexane Solubles**

All results reported on a DRY basis.

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 PCB'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 somewhat 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 POLLUTED	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 $\geq$ 1 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 mill, 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.

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 is 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

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

SEDIMENT SAMPLING IN
GREEN BAY HARBOR

July-August 1976

Pages B-20 to B-21

NOTE:

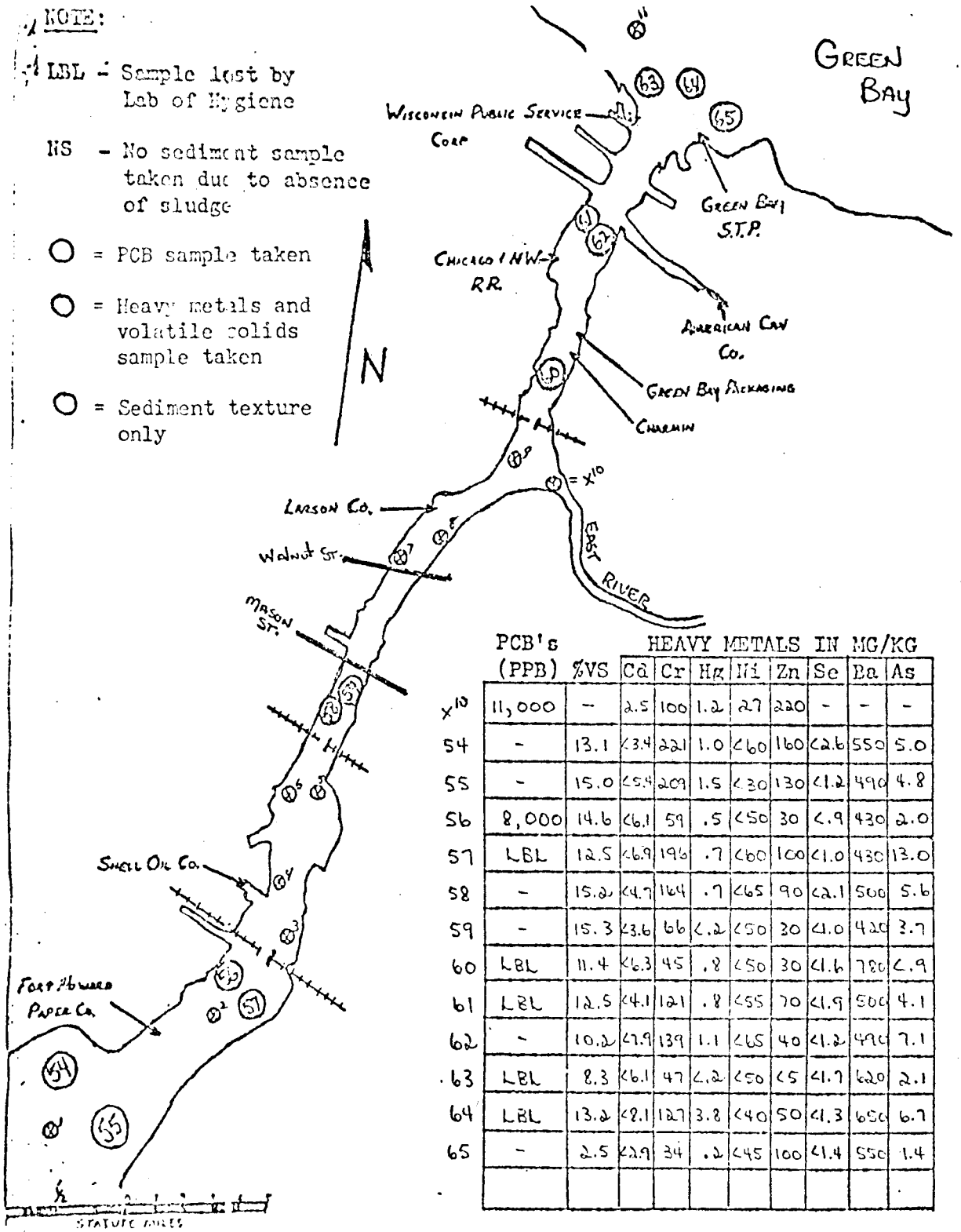
LBL - Sample lost by Lab of Hygiene

NS - No sediment sample taken due to absence of sludge

○ = PCB sample taken

○ = Heavy metals and volatile solids sample taken

○ = Sediment texture only



	PCB's (PPB)	%VS	HEAVY METALS IN MG/KG Cd	Cr	Hg	Ni	Zn	Se	Ba	As
x10	11,000	-	2.5	100	1.2	27	220	-	-	-
54	-	13.1	<3.4	221	1.0	<60	160	<2.6	550	5.0
55	-	15.0	<5.4	209	1.5	<30	130	<1.2	490	4.8
56	8,000	14.6	<6.1	59	.5	<50	30	<.9	430	2.0
57	LBL	12.5	<6.9	196	.7	<60	100	<1.0	430	13.0
58	-	15.2	<4.7	164	.7	<65	90	<2.1	500	5.6
59	-	15.3	<3.6	66	<.2	<50	30	<1.0	420	3.7
60	LBL	11.4	<6.3	45	.8	<50	30	<1.6	780	<.9
61	LBL	12.5	<4.1	121	.8	<55	70	<1.9	500	4.1
62	-	10.2	<7.9	139	1.1	<65	40	<1.2	490	7.1
63	LBL	8.3	<6.1	47	<.2	<50	<5	<1.7	620	2.1
64	LBL	13.2	<8.1	127	3.8	<40	50	<1.3	650	6.7
65	-	2.5	<2.9	34	.2	<45	100	<1.4	550	1.4

Source: Wisconsin Department of Natural Resources

SEDIMENT TEXTURES

54 - Small amt. sludge-1 pres. Some oil pres. 20% sand present. Some leaves, twigs present--indicates scouring effect.

x1 - No sludge pres. 50% o.m. indicates stream action. 50% sandy clay.

55 - 50% sludge-3 pres. Black color. Small chunks ¼-1" indicating advance stages of stabilizing but still some downstream movement. Some o.m. pres. Some oil.

56 - 50% sludge-2 present. Appears to be stabilizing due to clump. effect 1-3" clumps. 10% sand.

x2 - Small amt. sludge-2 pres. 10% sand.

57 - Small amt. sludge-1 pres. No oil present. Clay chunks present. Stabilized?

x3 - 75% sand & gravel. Some o.m. scoured fairly clean by current.

x4 - 75% sludge-4. "Slimy" blue-black color indicating fresh bed & no do.

x5 - 25% coal present. Some sludge-1 present. Small amt. o.m. & 50% gravel ¼-2".

x6 - Small amt. sludge-1 pres. 25% sand. Some o.m. present.

58 - Sludge-2 appears to be stabiliz. "Chunky" 1-3". [illegible]% sand & small gravel. Black color.

59 - Sludge-4. Grea[illegible] texture indica[illegible] not stabiliz. & downstream move[illegible] Fresh bed.

x7 - 50% sludge-2. Appears to be sta[illegible] Snails present. Some o.m.

x8 - Some sludge-1 pres. Snails pre[illegible] & 50% o.m. present.

x9 - 50% sludge-2 present. Clumping ½-2" to indicate stabilization. Snails present. Some o.m. pres[illegible]

x10 - 50% sludge-1 present. Very sli[illegible] character indicating new sludge [illegible] Has clay color, leaves, twigs p[illegible] Indicates sludge bed is moving downstream.

60 - 50% sludge-3 pres. No oil. Si[illegible] to Sta. 61--one continuous bed?

61 - 50% sludge-3 o.m. with oil pres[illegible] Blue-black color indicating ver[illegible] small or no do pres. Appears t[illegible] stabilizing due to "chunking" o[illegible] sample (1-3").

62 - Some sludge-2 pres. Rest sand [illegible] small gravel.

x11 - Almost 100% wood fibers & sludg[illegible] Small amt. oil pres. Blue-blac[illegible] color indicating lack of do.

63 - Some sludge-1 pres. No oil. 1[illegible] sand with rest wood fibers. Sm[illegible] amt. leaves, twigs pres. indica[illegible] flushing of river. Appears to [illegible] major deposit of wood fibers.

64 - Small amt. of sludge-2. 50% sa[illegible] pres. [illegible] clay color. Small leaves, twigs indicating flushi[illegible] action [illegible] river.

65 - No sl[illegible] pres. 10% small grav[illegible] Rest [illegible] silty-sand.

Source: Wisconsin Department of Natural Resources

Data Source: July-August 1976.

U.S. ARMY CORPS OF ENGINEERS

SEDIMENT SAMPLING NEAR
THE PROPOSED CONFINED DISPOSAL FACILITY
AT GREEN BAY HARBOR

Pages B-23 to B-34

Source: U. S. Army Waterways Experiment Station. 1976. Laboratory study of the release of pesticide and PCB materials to the water column during dredging and disposal operations. Vicksberg, Miss.

Green Bay Samples

39. Sampling - Samples were obtained from a previously undredged area which is scheduled to be dredged in the future to provide access to a proposed marina. The location of the sampling sites is shown in Figure 2. The area immediately adjacent to the sampling sites contain light industry, homes, and, a short distance to the east, a wildlife sanctuary. Sites 1 and 2 are near the mouth of the Fox River, which drains an area containing much industry, particularly paper mills. The water in the area sampled is very shallow, ranging from 1.2 to 1.8 meters in depth. Little or no compaction of the sediment occurred during sampling.

40. On the first day of sampling, September 9, 1974, the water temperature ranged from 22°C at the surface to 18°C at the bottom. Dissolved oxygen levels ranged from 6.2 mg/ℓ at the surface to 4.5 mg/ℓ at the bottom at sites 1, 2, and 3. Sites 4 and 5, which were nearer the shore, had dissolved oxygen concentrations ranging from 9.0 mg/ℓ (surface) to 6.2 mg/ℓ (bottom). All the temperature and dissolved oxygen measurements obtained at Green Bay are listed in Table D-2 of Appendix D. On the second sampling trip on January 18, 1975, additional samples of sediment, interfacial water, and water column water were obtained between sites 4 and 5. These samples were taken through hole drilled in the ice. Sediment samples were taken from 10 holes located in a line between sites 4 and 5. The water samples were obtained near site 4. At the time of sampling, ice thickness was about 0.45 m at site 5. Due to loss of the interfacial water sample, another sample was obtained on April 8, 1975. This sample was obtained from the edge of the ice shelf near site 5.

41. Analysis of water samples - The results of the analysis of the water samples obtained from Green Bay are listed in Table 4. The

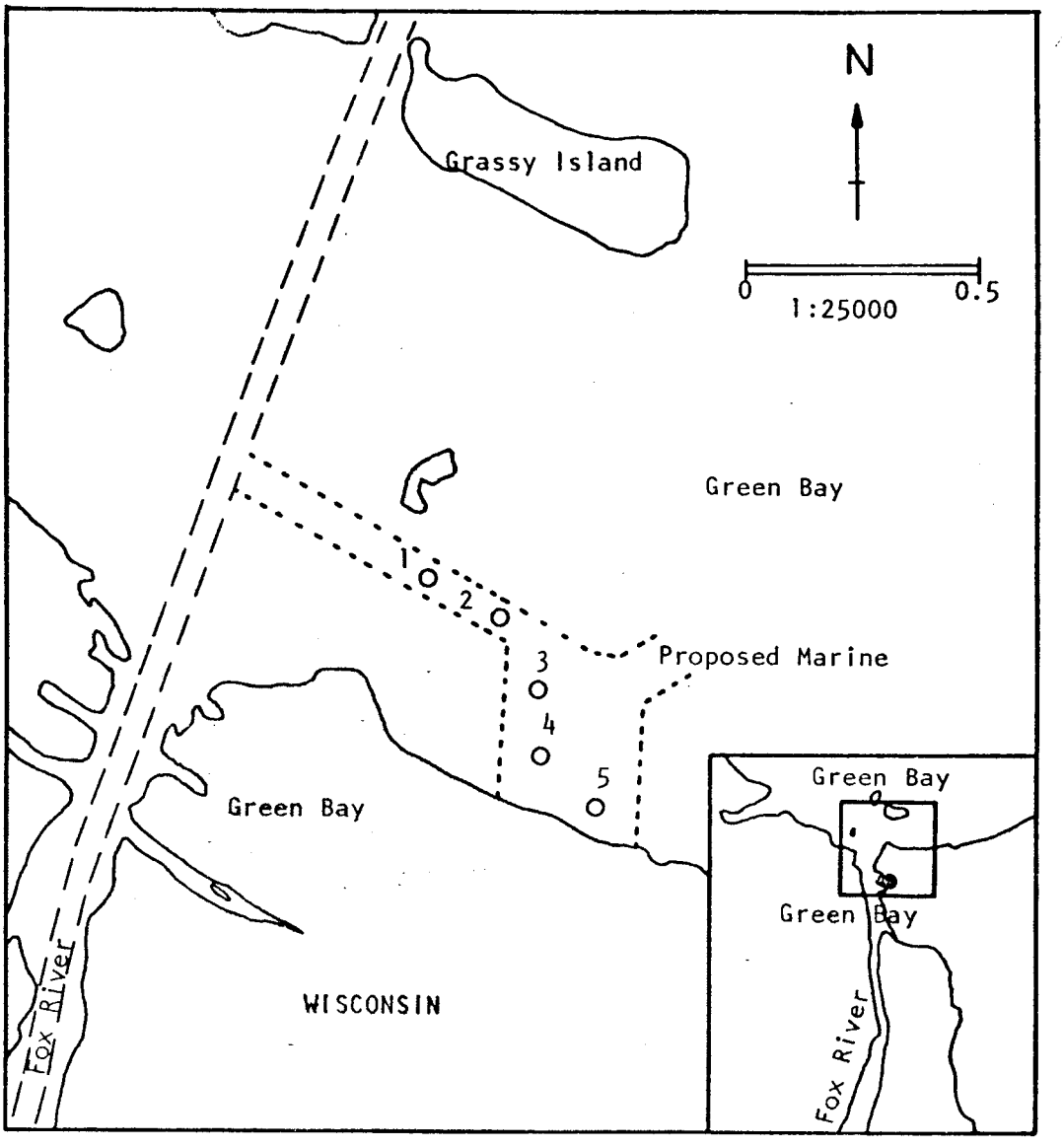


Figure 2. Green Bay Sampling Sites

Table D-2. Green Bay Water Column Temperature and Dissolved Oxygen Measurements, September 9, 1974

Water Depth, m	Temperature, °C					Dissolved Oxygen, mg/ℓ				
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 1	Site 2	Site 3	Site 4	Site 5
0.30	22	21	21	21	22	5.7	6.0	6.2	6.5	9.0
0.61	21	20	20	21	21	5.7	5.0	5.4	6.2	8.0
0.91	21	19	20	21	21	5.5	4.6	5.3	5.9	6.8
1.22	21	19	20	21	20	4.7	4.6	4.8	6.1	6.8
1.52	19	18	20	21	--	4.7	4.8	4.6	6.2	--
1.83	19	--	19	--	--	4.8	--	4.5	--	--

Table 4. Green Bay Water Sample Analyses

Parameter	Water Column	Interfacial Water					
Site	--	4-5	1	2	3	4	5
Sampling date	1/18/75	4/8/75	9/9/74	9/9/74	9/9/74	9/9/74	9/9/74
pH							
Suspended solids mg/ℓ	52	43	45	42	45	37	67
TOC, mg/ℓ	26	17	24	25	25	26	26
Soluble TOC, mg/ℓ	16	15	--	25	24	27	23
Oil and grease, mg/ℓ	25	--	--	--	--	--	--
PCB, μg/ℓ, total*	0.08	0.09	<1	<1	<1	<1	<1
Aroclor #1242, μg/ℓ	0.04	0.01	<1	<1	<1	<1	<1
Aroclor #1254, μg/ℓ	0.04	0.08	<1	<1	<1	<1	<1
Soluble PCB, μg/ℓ*	<0.02	--	--	--	--	--	--
Aldrin, μg/ℓ**	<0.002	<0.002	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin, μg/ℓ**	0.004	<0.002	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin, μg/ℓ**	<0.002	<0.002	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane, μg/ℓ**	<0.002	<0.002	<0.1	<0.1	<0.1	<0.1	<0.1
t-DDT, μg/ℓ**	<0.002	<0.002	<0.1	<0.1	<0.1	<0.1	<0.1
2,4-D, μg/ℓ**	<0.02	<0.02	<1	<1	<1	<1	<1
Toxaphene, μg/ℓ*	<0.02	<0.02	<1	<1	<1	<1	<1

* detection limit 0.02 μg/ℓ
** detection limit 0.002 μg/ℓ

TOC and suspended solids content of all the samples were similar spite of the difference in sampling times. The soluble TOC value of the samples taken through the ice were slightly lower than that o he samples taken in September, but were still higher than those foun it the other four dredging locations. An oil and grease analysis wa ber- formed on the water column sample to determine the amount of hexa extractable material. The result was 25 mg/ℓ. There was no odor r visual evidence of oil in the samples, but the samples did contai algae. Perhaps the presence of algae may be the reason for the h h TOC and hexane extractable values.

42. Green Bay was the only location tested that contained P s similar to both Aroclor 1242 and 1254. The PCBs found in the wat column were apparently associated with the suspended solids, sinc no detectable soluble amount was found. Although the chromatograms indicated that equal amounts of 1242 and 1254 were present in the ater column water obtained in January, almost all the PCB in the inter cial water obtained in April was similar to Aroclor 1254. The total a unt of PCB was similar for both samples, however. The small amount o dieldrin (0.004 μg/ℓ) found in the water column was not found in e interfacial water sample. No measurable amount of dieldrin was f nd in the water column water after removal of the suspended solids.

43. Analysis of sediment samples - The physical characteristics of the samples obtained from Green Bay are listed in Table 5. Samples from sites 1 and 2 were black and appeared to be a mixture of muck and sand. The bottom segment from site 1 contained some plant roots. The bottom segment from site 2 and all the samples from sites 3, 4, and 5 were primarily sand. The migration test sample appeared to be representative of the samples from sites 4 and 5 in particle-size characteristics.

44. The chemical characteristics of the Green Bay Sediments are presented in Table 6. Site 5, farthest from the mouth of the Fox, had the highest PCB and oil levels. Nearby, site 4 had the lowest levels of each parameter (except total solids). The sediment from site 1 did not appear to be unusually contaminated with oil or PCB materials in spite of its nearness to the mouth of the Fox River. The high TOC value for the bottom segment from site 1 is probably due to vegeta ive material.

45. The concentrations of Aroclor 1242 were much greater in the upper segment for all sites. TOC values were slightly higher and total solids values were slightly lower in the upper portions of the sed ent at sites 2, 3, 4, and 5. Oil and Aroclor 1242 concentration showed no pattern with depth of sediment. Whereas equal amounts of Aroclor 242 and 1254 were found in the water column and Aroclor 1254 predominated in the interfacial water, the predominant form in the sediment was Aroclor 1242. No measurable amount of dieldrin was found in the sediment.

Table 5. Green Bay Sediment Characteristics

Sample Site	Depth Sampled m	Core Length m	Core Segment	Density g/cc	Particle-Size Analysis: Median Diameter m	Grain Size, %: Gravel	Sand	Silt % Clay
1	0.30	0.28	Top	1.90	0.070	0	63	37
			Bottom	1.63	0.051	0	41	59
2	0.30	0.30	Top	1.80	0.089	0	75	25
			Bottom	1.92	0.184	0	94	6
3	0.30	0.25	Top	1.93	0.113	0	96	4
			Bottom	1.86	0.117	0	98	2
4	0.30	0.30	Top	1.99	0.140	0	98	2
			Bottom	1.94	0.116	0	96	4
5	0.38	0.25	Top	1.85	0.110	0	95	5
			Bottom	1.90	0.110	0	97	3
Migration Test Sample--		--	--	1.87	0.100	0	96	4

Table 6. Green Bay Sediment Analysis

Sample Site	Core Segment	Total Solids,%	TOC mg/kg	Oil mg/kg	t-DDT* µg/kg	PCB, µg/kg Total	#1242	#1254
1	Top	78.5	1,650	136	0.2	33	33	<1
	Bottom	46.5	17,600	740	<0.1	6	<1	6
2	Top	76.5	3,790	380	<0.1	96	96	<1
	Bottom	83.9	1,440	390	<0.1	<1	<1	<1
3	Top	77.5	1,920	260	<0.1	301	242	59
	Bottom	80.0	1,240	250	<0.1	12	12	<1
4	Top	81.8	670	96	<0.1	18	14	4
	Bottom	82.0	610	240	<0.1	6	6	<1
5	Top	76.3	1,950	850	<0.1	517	517	<1
	Bottom	79.9	1,770	630	<0.1	163	150	13
Migration Test Sample --		77.9	159	233	<0.1	184	177	7

Note: mg/kg and µg/kg values are in terms of dry solids.

* o,p - DDE

Green Bay Migration Tests

67. Equilibrium test results - The Green Bay sediment was unique in that it represented an undredged site and it was the highest of all sites in sand fraction (90 percent). The Green Bay water column was highest in hexane extractables although, by observation, the residue from the oil and grease analysis did not have the oil consistency noted in the Chicago water column water sample but seemed somewhat waxy. This observation also held for the oils (hexane solubles) extracted from the sediment used in the equilibrium test. Concentration of dieldrin (0.004 µg/ℓ) and total PCBs (0.08 µg/ℓ) reported in Table 20 represent the highest values of these species of all the overlying water columns tested; however, after centrifugation all values dropped below the limits of detection. Green Bay was also unique in that it was the only site which contained PCB Aroclor 1242 and Aroclor 1254. The ratio of 1242/1254 differed widely depending on the medium investigated. In the sediment, for example, the ratio was 25.3:1; while in the interstitial water and water column water, the ratios were 0.63:1 and 1:1, respectively.

68. The desorption evaluations in Table 21 show that the initial soluble total PCB concentration contributed little to the total amount of soluble PCB persent after 24-hr mixing at the 1:4 ratio. Aroclor 1254 demonstrated greater desorption than 1242, illustrated by a 1242/1254 ratio of 0.14:1, the lowest ratio of all media tested at Green Bay. No pesticides of interest were found at soluble concentrations above the detection limits of this study for all mixing ratios.

Table 20. Green Bay Equilibrium Test Conditions and Results

Sediment Characteristics:			
Total solids, % by wt	77.9		
Total volatile solids, % by wt	0.5		
Specific gravity, g/cc	1.87		
TOC, mg/kg, dry solids	159		
Oil and grease, mg/kg dry solids	233		
Total PCB, µg/kg dry solids	184		
PCB (Aroclor #1242)	177		
PCB (Aroclor #1254)	7		
Sediment Interstitial Water Characteristics:			
TOC mg/ℓ	25		
Total PCB's, µg/ℓ	0.13		
PCB (Aroclor #1242)	0.05		
PCB (Aroclor #1254)	0.08		
Water Column Characteristics:			
Suspended solids, mg/ℓ	52		
TOC, mg/ℓ	26		
Soluble TOC, mg/ℓ	16		
Oil and grease, mg/ℓ	25		
Total PCB's, µg/ℓ	0.08		
PCB (Aroclor #1242)	0.04		
PCB (Aroclor #1254)	0.04		
Soluble PCB µg/ℓ	<0.02		
Total Dieldrin µg/ℓ	0.004		
Soluble Dieldrin µg/ℓ	<0.002		
Ratio Wet Sediment/Water:	1:4	1:10	1:30
Concentration of Solubles After 24 hr:			
TOC mg/ℓ	19	17	22
Total PCB, µg/ℓ	0.16	<0.02	<0.02
PCB (Aroclor #1242)	0.02	<0.02	<0.02
PCB (Aroclor #1254)	0.14	<0.02	<0.02
t-DDT, µg/ℓ	<0.002	<0.002	<0.002
Aldrin-dieldrin, µg/ℓ	<0.002	<0.002	<0.002
Endrin, µg/ℓ	<0.002	<0.002	<0.002
Lindane, µg/ℓ	<0.002	<0.002	<0.002
2,4-D (esters), µg/ℓ	<0.02	<0.02	<0.02
Toxaphene, µg/ℓ	<0.02	<0.02	<0.02

Table 21. Green Bay Equilibrium Test Evaluation

Ratio - Sediment/Water	1:4	1:10	1:30
Initial Concentrations			
Grams wet sediment/ℓ	220	95	33
Grams dry sediment/ℓ	172	74	26
ml interstitial/ℓ	48	21	7
ml dilution water/ℓ	882	949	982
TOC Values, mg/ℓ			
Due to sediment solids	27	12	4
Due to dilution water	23	25	26
Total TOC	50	37	30
Soluble TOC Values mg/ℓ			
Due to interstitial water	1.2	0.5	0.2
Due to dilution water	14.1	15.2	15.7
Total soluble TOC	15.3	15.7	15.9
TOC after mixing 24 hr	19	17	22
TOC desorbed	3.7	1.3	6.1
Total PCB, μg/ℓ			
Due to sediment solids (total)	31.65	13.62	4.78
(Aroclor #1242)	30.45	13.10	4.60
(Aroclor #1254)	1.20	0.52	0.18
Due to dilution water (total)	0.07	0.08	0.08
(Aroclor #1242)	0.035	0.04	0.04
(Aroclor #1254)	0.035	0.04	0.04
Total PCB	31.75	13.70	4.86
(Aroclor #1242)	30.48	13.14	4.64
(Aroclor #1254)	1.24	0.056	0.22
Soluble PCB, μg/ℓ			
Due to interstitial water	0.006	0.003	0.001
Due to dilution water	<0.02	<0.02	<0.02
Total initial soluble	<0.02	<0.02	<0.02
After mixing soluble PCB	0.16	<0.02	<0.02
(Aroclor #1242)	0.02	<0.02	<0.02
(Aroclor #1254)	0.14	<0.02	<0.02
PCB desorbed	0.16	<0.02	<0.02
(Aroclor #1242)	0.02	<0.02	<0.02
(Aroclor #1254)	0.14	<0.02	<0.02

Underlined numbers are calculated values.

69. Soluble TOC increased substantially during all three batch desorption tests at the 1:30 sediment-to-water ratio, a 45.9 percent increase in soluble TOC was measured. At the 1:4 and 1:10 ratios the increases in soluble TOC were substantially less, 14.2 and 9.0 percent, respectively. The Green Bay desorption tests results showed no apparent relationship between the desorption of TOC and the desorption of the nonpolar chlorinated hydrocarbons.

70. Settling test results - Oils, PCBs and TOC reported in Table 22 decreased in concentration with a decrease in suspended solids. In the sediment-to-water ratio (1:4) used for the Green Bay settling tests, desorption of PCBs occurred in the equilibrium tests, and it is possible that the PCB concentrations reported for the various settling times may include soluble PCB. However, it is reasonable to assume that, if desorption did take place, it occurred at a reduced rate from that observed during the equilibrium tests due to the fact that the sediment-to-water contact time during a settling test was much less than during the 24-hr of agitation for desorption tests. The final total PCB concentration in the settling tests was lower than the total PCBs desorbed after 24-hr for the 1:4 desorption tests.

71. The role that the suspended particulates, with associated PCBs, play in increasing the supernatant total PCB concentration can be dramatically demonstrated by using the water column total PCB concentration as a reference total PCB level and comparing the decrease with time. After 30-min settling, the total PCB concentration in the settling test water column was increased 13.4 times over the initial concentration; after 1 hour the increase was 8.8 times; after 3 hours 2.8 times; and after 24 hours the level of total PCB had returned to the initial water column concentration of 0.08 μg/ℓ.

72. The ratio of Aroclor 1242 to Aroclor 1254 remained reasonably consistant throughout the settling test, averaging 0.61:1.

73. The organic fraction of the suspended solids increased with settling time ranging from 8 percent after 30 min to 25.4 percent after 24 hr. The soluble TOC values were not significantly different for the samples from the four settling tests.

74. An analysis of the oil and grease values from Table 22 points out an incongruity between the initial oil concentration and those subsequently measured during the settling tests. The 30-min and 1-hr oil concentrations are not possible given the initial oil concentration. Efforts to resolve the inconsistency were fruitless, and it is suggested that the cause may have been due to the nonhomogeneity of the sandy sample, which contained roots and decaying vegetative matter.

Table 22. Green Bay Settling Test Results

Ratio - Sediment:Water = 1:4

Initial Concentrations:				
Wet mud added, g/ℓ	220			
Suspended solids, mg/ℓ	171,380			
TOC, mg/ℓ	50			
Oil and grease, mg/ℓ	62			
PCB, μg/ℓ	31.72			
PCB (Aroclor #1242)	30.48			
PCB (Aroclor #1254)	1.24			
Settling Times:	0.5 hr	1 hr	3 hr	24 hr
Supernatent Concentrations:				
Suspended Solids, mg/ℓ	324	295	170	71
Turbidity, FTU	150	150	95	60
Oil and grease, mg/ℓ	137	74	41	14
TOC, mg/ℓ	44	49	31	33
Soluble TOC, mg/ℓ	18	24	23	15
PCB, μg/ℓ	1.07	0.70	0.22	0.08
PCB (Aroclor #1242)	0.68	0.39	0.15	0.05
PCB (Aroclor #1254)	0.39	0.31	0.07	0.03

Underlined numbers are calculated values.

APPENDIX C

SECTION 123 OF THE RIVER AND HARBOR

act of 1970 (PL 91-611)

* * * * * * * * *

Sec. 123. (a) The Secretary of the Army, acting through the Chief of Engineers, is authorized to construct, operate and maintain, subject to the provisions of subsection (c), contained spoil disposal facilities of sufficient capacity for a period not to exceed ten years, to meet the requirements of this section. Before establishing each such facility, the Secretary of the Army shall obtain the concurrence of appropriate local governments and shall consider the views and recommendations of the Administrator of the Environmental Protection Agency and shall comply with requirements of section 21 of the Federal Water Pollution Control Act, and of the National Environmental Policy Act of 1969. Section 9 of the River and Harbor Act of 1899 shall not apply to any facility authorized by this section.

(b) The Secretary of the Army, acting through the Chief of Engineers, shall establish the contained spoil disposal facilities authorized in subsection (a) at the earliest practicable date, taking into consideration the views and recommendations of the Administrator of the Environmental Protection Agency as to those areas which, in the Administrator's judgment are most urgently in need of such facilities and pursuant to the requirements of the National Environmental Policy Act of 1969 and the Federal Water Pollution Control Act.

(c) 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) contribute to the United States 25 per centum of the construction costs, such amount to be payable either in cash prior to construction, in installments during construction or in installments, with interest at a rate to be determined by the Secretary of the Treasury, as of the beginning of the fiscal year in which construction is initiated, on the basis of the computed average interest rate payable by the Treasury upon its outstanding marketable public obligations, which are neither due or callable for redemption for fifteen years from date of issue; (3) hold and save the United States free from damages due to construction, operation, and maintenance of the facility, and (4) except as provided in subsection (f), maintain the facility after completion of its use for disposal purposes in a manner satisfactory to the Secretary of the Army.

(d) The requirement for appropriate non-Federal interest or interests to furnish an agreement to contribute 25 per centum of the construction costs as set forth in subsection (c) shall be waived by the Secretary of the Army upon a finding by the Administrator of the Environmental Protection Agency that for the area to which such construction applies, the State or States involved, interstate agency, municipality, and other appropriate political subdivision of the State and industrial

concerns are 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 and the Administrator has found that applicable water quality standards are not being violated.

(e) Notwithstanding any other provision of law, all costs of disposal of dredged spoil from the project for the Great Lakes connecting channels, Michigan, shall be borne by the United States.

(f) The participating non-Federal interest or interests shall retain title to all lands, easements, and rights-of-way furnished by it pursuant to subsection (c). A spoil disposal facility owned by a non-Federal interest or interests may be conveyed to another party only after completion of the facility's use for disposal purposes and after the transferee agrees in writing to use or maintain the facility in a manner which the Secretary of the Army determines to be satisfactory.

(g) Any spoil disposal facilities constructed under the provisions of this section shall be made available to Federal licensees or permittees upon payment of an appropriate charge for such use. Twenty-five per centum of such charge shall be remitted to the participating non-Federal interest or interest except for those excused from contributing to the construction costs under subsections (d) and (e).

(h) This section, other than subsection (i), shall be applicable only to the Great Lakes and their connecting channels.

(i) The Chief of Engineers, under the direction of the Secretary of the Army, is hereby authorized to extend to all navigable waters, connecting channels, tributary streams, other waters of the United States and waters contiguous to the United States, a comprehensive program of research, study, and experimentation relating to dredged spoil. This program shall be carried out in cooperation with other Federal and State agencies, and shall include, but not be limited to investigations on the characteristics of dredged spoil and alternative methods of its disposal. To the extent that such study shall include the effects of such dredge spoil on water quality, the facilities and personnel of the Environmental Protection Agency shall be utilized.

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APPENDIX D

MAINTENANCE EQUIPMENT AND METHODS

GREEN BAY HARBOR, WISCONSIN

Introduction

D.01 Maintenance activities at Green Bay Harbor consist of various operations in the navigation channelto provide for the needs of existing commerce. Continued safe navigation at the harbor is accomplished through a specific series of tasks using suitable maintenance equipment. The following sections describe the various maintenance activities and equipment that will be employed in the maintenance of Green Bay Harbor after 1977. Quantitative measurements of vessel dimensions, dredging, capacities, dredging costs, and other characteristics of maintenance equipment and methods are presented in Tables D.1-D.4 for general comparative purposes. Specific characteristics of equipment are dependent upon the actual vessel used by, or available to, the Corps or contractors bidding on government contracts for minor parts of the work, and the exact nature of harbor conditions at the time of maintenance operations.

Channel Maintenance

General

D.02 The maintenance of authorized harbor navigation channels generally consists of a sounding survey, dredging, and disposal operations. Discussions of the nature of each of these activities, and the equipment used during each activity, are presented in the following paragraphs.

Sounding Survey

D.03 Prior to the removal of channel shoals by dredging operations, authorized navigation channels are inspected by the Corps to determine the location and amount of sediment deposition. An initial inspection is conducted with the use of sounding equipment installed on a small survey launch. Survey launches are small inboard, outboard, or inboard-outboard craft, similar to a recreational pleasure boat, with average dimensions of 20 feet in length, 7 feet in width, and 2 feet in draft. As the launch cruises the project channels, the channel depths are recorded, by the sounding equipment, at established channel reference points. The sounding survey generally takes about two-three weeks to complete but may require more time if adverse weather is encountered. Upon completion of the survey, recorded sounding information is used to prepare harbor maps that display the predredging channel depths in the project area. Maps from past sounding surveys at Green Bay Harbor are available for review at the Chicago District Office.

Dredging and Disposal Operations

D.04 After the navigation channel has been surveyed, shoal areas, in which sediment accretions have accumulated and decreased channel depth to less than those authorized, are dredged if necessary to safe navigation. Dredging operations at Green Bay Harbor will be mainly accomplished by a Corps hopper dredge (Table D.4) but with some minor work performed

by contract dredges (Tables D.1-D.3). The following two paragraphs briefly describe the dredging operation of the hopper dredge and other dredges.

D.05 Hydraulic dredges, such as the hopper or cutterhead pipeline dredge, excavate shoaled material in the channel by either hydraulically or mechanically dislodging the sediments. Sediments are picked up within a moving stream of water that is discharged into onboard hoppers on a hopper dredge or conveyed directly to a disposal site by a floating pipeline in the case of a cutterhead pipeline dredge. The vessel motor or separate pumps are used to maintain the flow of water and sediment. When the onboard hoppers of the hopper dredge have accumulated an economical load of sediment, the hopper dredge moves to the pumpout facility to hydraulically transfer the dredged material through a stationary pipeline to the confined disposal facility. Hydraulic dredges are catergorized under descriptive names such as: hopper, cutterhead, dust pan, sidcasting, and sand suction. These names describe some prominent feature of that dredge type which is specifically designed for a special type of dredging. Only the hopper and cutterhead pipeline dredges are in common use on the Great Lakes. Disadvantages of the hopper dredge include limited manuvering ability in narrow sections of channels and the need for approximately 14-15 feet of water depth. However, a great advantage of the hopper dredge is that it is self-propelled, needs no auxillary tugs or vessels, and has minimal set-up time before beginning dredging operations. The disadvantages of the cutterhead pipeline dredge include: long set-up and take-down time before and after dredging plus a definite limit on the distance dredged materials can be pumped to a disposal area. The advantage of the cutterhead pipeline dredge is mainly economic, because once it is set up at an area where large amounts of material must be removed, it is the most economical and controlable dredge type if its pipeline and pumps can reach the disposal area. However, the long length of the harbor at Green Bay and the location of the confined disposal area make the cutterhead pipeline dredge unfeasible at Green Bay except for minor work in restricted areas.

D.06 Mechanical dredges excavate channel bottom sediments by an arrangement of machinery on board a vessel that pushes, pulls or otherwise forces a container (normally termed a bucket) into the sediments in a manner to fill the container with the sediments. Once filled, the container (bucket) is lifted by the dredge machinery above the surface of the water where the sediments are placed or dumped into a vessel apart from the dredge, normally a scow alongside. Once the scow has been filled with an economical load of dredgings, it is transported to the selected site for material disposal. The method used to remove the dredged material from the scow is dependent upon the disposal site and the type of scow being used. Some scows are equipped with doors in the bottom of their hull that can be opened over an open-lake disposal site to release contained material. Others are built in two sections that may be swung apart to release material at an open-lake site. Use of a scow to place dredged material

into a confined disposal facility would necessitate another crane or dredge to rehandle the material from the scow into the facility. Many variations exist in the arrangements of dredge machinery. Specific types of mechanical dredges that may be used for minor maintenance dredging at Green Bay Harbor are the clamshell and dipper dredges. General information about the operating and performance characteristics, dimensions and operating costs of clamshell and dipper dredges are presented in Tables D.1 and D.2.

D.07 Dredging operations, involving the tasks of removing, transporting, and disposing of shoal material, continue until desired channel depths have been reached. The duration of such activities is dependent upon the volume and physical composition of dredgings, the type of equipment used, weather and wave conditions, and other factors that may influence operational efficiency. Upon completion of dredging operations, a post-dredging survey, using a survey launch, is conducted to determine depths in maintenance-completed channels.

Maintenance Personnel

D.08 The number of personnel onboard maintenance vessels is generally dependent upon each individual vessel's manpower requirements for safe and efficient operations. Typical vessel crew sizes are four on a survey launch and tug, and eight to twenty on a dredge. Each crew is comprised of one or two officers (captain, mates, engineers) and several crewmen (deckhands, oilers, etc.). A normal work day often exceeds eight hours, and the work week usually consists of six days. Maintenance personnel will probably obtain food and other services and products from local businesses.

Table D.1

General Characteristics: Clamshell Dredge

Type of Dredge: Mechanical

Description: A low-lying, flat-bottomed vessel; equipped with a clamshell bucket suspended by cables from a forward-extending, rotating boom assembly operating in conjunction with an auxillary scow.

Typical Dimensions: 120 feet length, 50 foot width, 6 foot draft

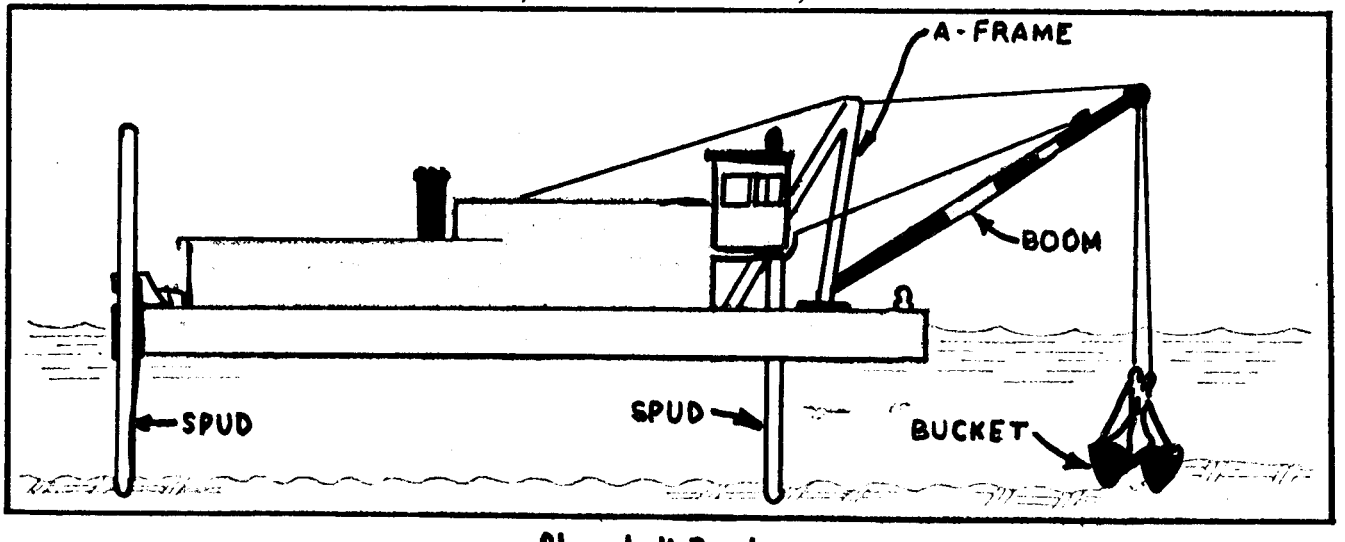
Mobility: Moved and maneuvered by a tug; moved by operation of spuds or winches while dredging.

Dredging Suitability: Best suited for excavating soft or cohesive materials; useful for deep digging and for dredging in confined areas alongside structures.

Means of Dredging: The open clamshell bucket is lowered onto the shoal material. As the bucket jaws are closed, material is scooped into the bucket. The filled bucket is then raised above water level; moved, on the rotating boom, into position over a dump scow; and opened to release dredgings into the scow.

Dredging Capacity: Dependent upon bucket size, depth of cut, and material dredged; may range up to 400 cubic yards an hour when excavating soft, light-weight material with a special 12 cubic yard, light-weight bucket.

Dredging Costs: Generally in the range of $2.00 to $4.00 per cubic yard of material excavated. Costs are dependent on many factors such as size of bucket, dredge horsepower, type of material being dredged, location of disposal site, availability of scows and many similar items.



Clamshell Dredge

Table D.2

General Characteristics: Dipper Dredge

Type of Dredge: Mechanical

Description: A low-lying, flat-bottomed vessel; equipped with a dipper bucket mounted on a forward-extending, rotating boom assembly operating in conjunction with an auxillary scow.

Typical Dimensions: 120 foot length, 50 foot width, 6 foot draft.

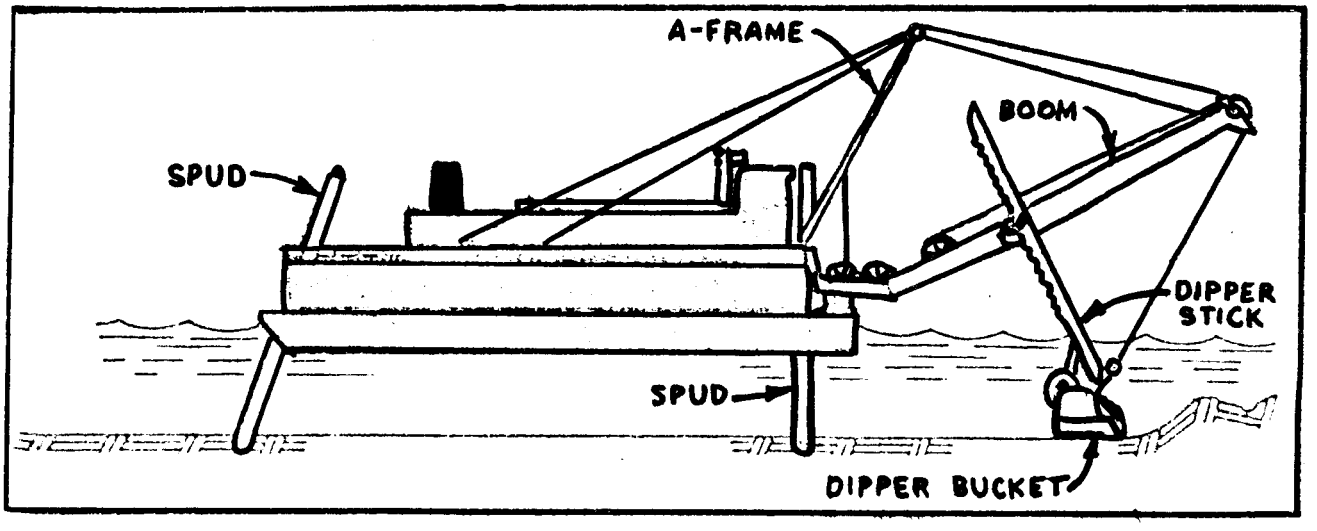
Mobility: Moved and maneuvered by a tug; moved by operation of spuds or winches while dredging.

Dredging Suitability: Useful for dredging hard compacted material, including some types of ledge rock.

Means of Dredging: The dipper bucket is lowered onto the shoal, and as it's raised, its open edge cuts through the shoal and scoops material into the bucket. The filled bucket is raised above water level, moved on the rotating boom into position over a dump scow, and the bottom door of the bucket being tripped to dump material into the scow. A variation of the dipper dredge, often called a backhoe, digs or scoops in the reverse direction i.e. toward the dredge.

Dredging Capacity: Dependent upon bucket size, depth of cut, and material dredged; may range up to 400 cubic yards an hour.

Dredging Costs: Generally in the range of $2.00 to $5.00 per cubic yard; dependent upon dredging capacity of an individual dredge.



Dipper Dredge

Table D.3

General Characteristics: Cutterhead Dredge

Type of Dredge: Hydraulic, pipeline

Description: A low-lying, flat-bottomed vessel; equipped with a revolving cutterhead surrounding the intake end of a submerged, forward-estending suction line.

Typical Dimensions: 100 foot lenth, 30 foot width, 6 foot draft

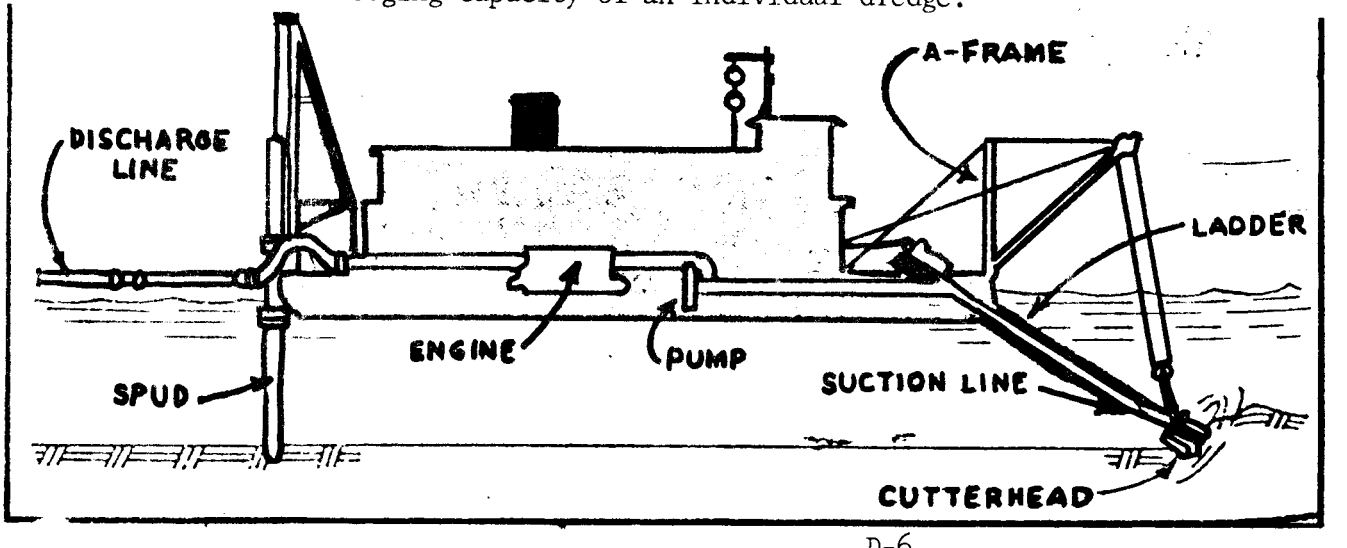
Mobility: Moved and maneuvered by a tug; moved by operation of spuds or winches while dredging.

Dredgin Suitability: Used most frequently for dredging large amounts of soft or loose materials where final disposal can be accomplished within the range of the discharge pipeline. Many variations exist involving such things as changes in the type of cutterhead and providing additional pumps in the pipeline system. Largest mobilization costs of any dredge type.

Means of Dredging: The revolving cutterhead breaks through and loosens shoal material, which is drawn up through the suction line. The cutterhead is swept across the shoal as the dredge moves ahead into the cut. Material drawn through the suction line is pumped, through a discharge line, into a dump scow.

Dredging Capacity: Dependent upon horsepower of pumping and cutterhead machinery, sizes and length of pipeline, nature of dredgings, and other factors; may range up to 600 cubic yards an hour.

Dredging Costs: About $1.00 per cubic yard of material; dependent upon dredging capacity of an individual dredge.



Cutterhead Dredge

Table D.4

General Characteristics: Hopper Dredge

Type of Dredge: Hydraulic, hopper

Description: A self-propelled ship; equipped with one or more dredging pumps in hold connected to two outside mounted movable vacuum drag heads.

Typical Dimensions: 200 foot length, 40 foot width, 13 foot draft, loaded.

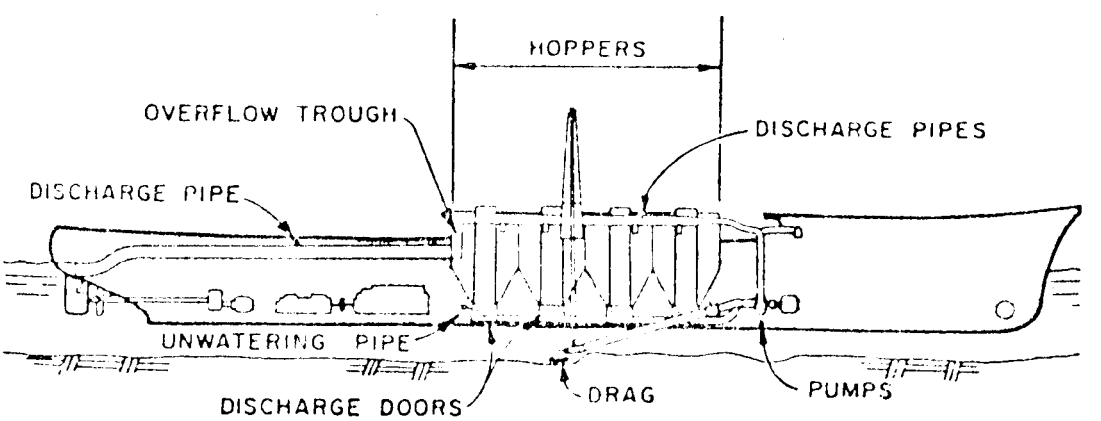
Mobility: Self propelled; must be underway to dredge effectively.

Dredging Suitability: Particularly effective in romoving a thin layer of sediment covering extensive areas. Used most frequently for dredging large deep harbors where the vessel can maneuver and soft or loose materials are to be removed. To unload, the vessel moves to a pumpout facility for hydraulic pipeline conveyance to a disposal area.

Mean of Dredging: Dredging is accomplished when the vessel is underway at slow speed with the drag vacuum heads in contact with the bottom. The dredged material is discharged into onboard hoppers where they settle. When it will not significantly harm the aquatic ecosystem fines and excess water are allowed to overflow at the top of the hoppers. Dredging at each pass continues until an economical load has been accumulated in the hoppers.

Dredging Capacity: Dependent upon horsepower of pumps and capacity of hoppers. Hopper capacity is usually under 1000 cubic yards.

Dredging Costs: About $2.00 per cubic yard of material; dependent upon hopper capacity and amount of dredging to be done.



HOPPER DREDGE

APPENDIX E

CONSTRUCTION AND OPERATION

OF

CONFINED DISPOSAL FACILITIES

CONSTRUCTION AND OPERATION

OF

CONFINED DISPOSAL FACILITIES

Introduction

E.01 Maintenance dredging is required to provide adequate depth in navigation channels as these channels fill in from many sources. Runoff from adjacent land carries silt which settles out in the channels. Littoral drift along shorelines results in sand deposits at harbor entrances. Waste discharges and ship movements also fill in navigation channels.

E.02 The Federal Environmental Protection Agency has been given the responsibility to determine the suitability of sediments for open-water disposal. Materials unsuitable for open-water disposal must be confined in a manner to prevent the reintroduction of the pollutants in the sediments to the watercourse or lake.

Type of Facilities

E.03 Confined disposal facilities may be divided into two general categories classified by the facility location. These categories are (1) land (upland) disposal facilities i.e., disposal facilities constructed in a terrestrial environment and (2) water or lake fill disposal areas that are constructed in a marine environment.

E.04 The structures used for these confinement facilities are dependent on the site and volume requirements. Upland sites are usually designed with earthen dikes as the confinement structures utilizing straightforward soils engineering techniques. Water-fill structures are designed to function as breakwaters or jetties subject to substantial wave forces. These structures are designed as graded (zoned) stone structures with a steel sheet pile diaphragm or an internal filter to prevent migration of dredged material through the structure.

E.05 Confined disposal facilities are designed and constructed to prevent pollutants which have collected in sediments in the navigation channels from re-entering the environment. Confined disposal facilities both marine and terrestrial may be designed to function as filters, being constructed of filter materials which allow the escape of the liquid portion of dredged material or precipitation which enters the disposal area, while containing the sediments. This concept is useful when large volumes of water such as that produced by a hydraulic dredging operation is used to remove the sediments from the navigation channel. Another confinement concept consists of building the confinement facility as impervious as possible and containing both the liquid and solid portion of the sediments. This method depends upon evaporation alone for removal of the liquid portion of sediments and precipitation falling within the disposal area, and of itself is not

feasible where precipitation exceeds or is equivalent to evaporation, or when hydraulic dredging operations are anticipated. The more common method of confinement consists of an impervious structure, in combination with pervious filters to discharge the liquid portion of the dredged materials and yet retain the pollutants in the disposal area.

E.06 Construction Techniques - Ordinary terrestrial or marine construction techniques are utilized for construction of the facilities. Confined disposal areas are constructed through the use of tracked or tired vehicles, trucks, scrapers and other equipment similar to that used for construction of levees, dikes and earth dams. In most cases, the confinement structure consists of earthen dikes, which if necessary, may be protected from wave action from adjacent lakes or streams through construction of riprap stone revetments. A portion of the dike may be constructed from a filter material consisting of natural sand and stone with specific design gradations to function as a filter which serves to cleanse precipitation and excess dredge water prior to discharge from the structure. Facilities built in an open water environment are constructed of graded stone, steel and/or concrete utilizing floating plant, i.e., scows, barges, floating cranes, etc., to resist windblown wave attack and severe erosive attacks by nature.

Operation

E.07 Although dredging methods remain the same, construction of confined dredged material facilities has required development of new techniques for rehandling dredged materials. Pipeline dredges can pump directly into the confinement areas. If pipeline routes are not available or the distance between the dredging area and the disposal facility is too great for an economical operation, scows may be emptied mechanically at the disposal facility or modified hydraulic dredges are used to rehandle material from the scows into the disposal facility. Corps' hopper dredges have been modified to incorporate direct pump-out capability which allows the dredge to unload directly into the disposal facility.

F.08 During and after use, water quality monitoring is conducted to determine if pollutants escape from the confinement facility, and that the effluents are of acceptable quality. Water samples are collected and analyzed prior to, during and after filling operations. Should contaminants appear outside the facility sufficient to impact on water quality, operations are curtailed until the cause can be determined and corrected.

Maintenance

E.09 Confined disposal facilities require periodic maintenance to restore damage caused by operation or by natural events. The maintenance requirements consist of those identical to other civil works projects such as levees, revetments and navigation structures, and consist of restoring eroded dike sections and replacement of stone displaced by wind-driven waves. In addition, effluent filters require periodic cleaning and replacement to remain effective, and previously placed dredged materials may require reworking and shaping for adequate drainage and stabilization.

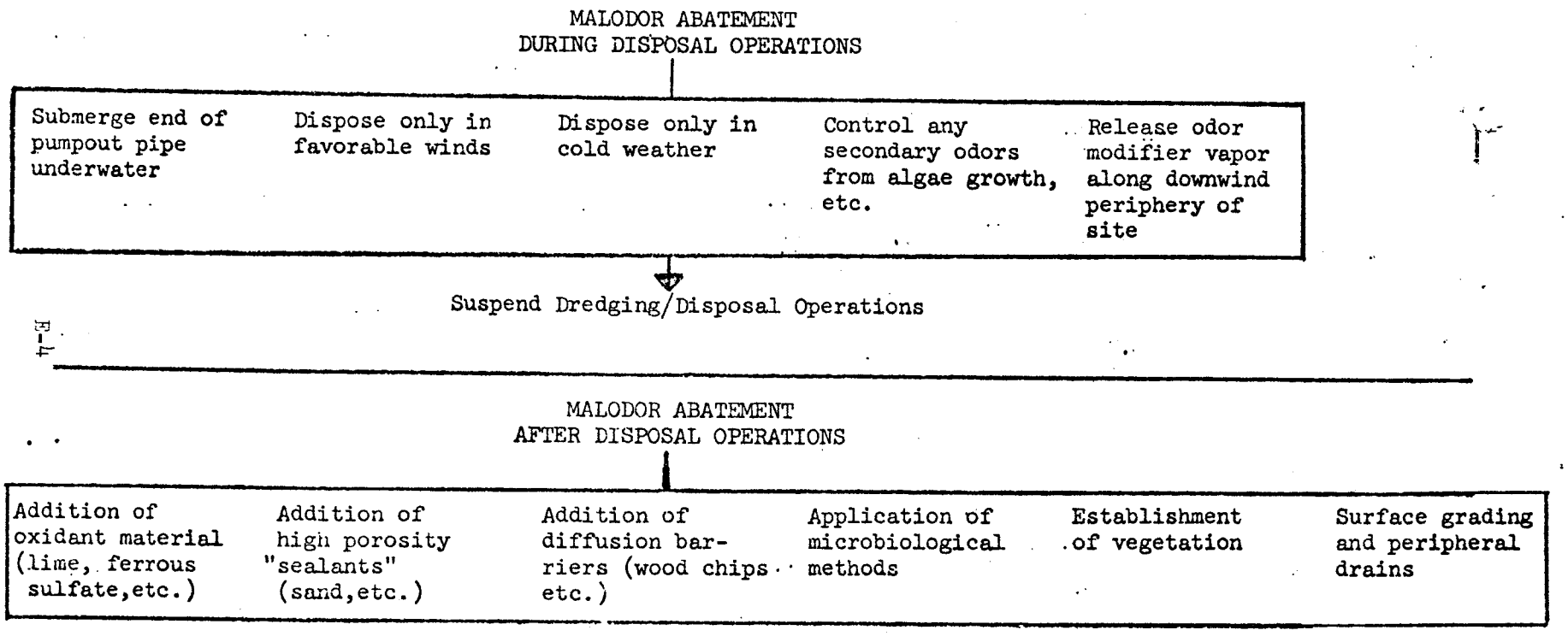
Future Use and Development

E.10 After completion of filling, disposal facilities are turned over to the local project sponsor for use and development. Uses are varied and include providing or recovering additional land for public use or development, providing material for sanitary landfill cover and ski hill construction. Off-shore islands provide erosion protection of valuable marsh and wetland areas, recreational boat harbors, and wildlife refuges.

Control of Malodors

E.11 During and for a short period after the use of a disposal facility for disposal of polluted dredged materials, objectionable malodors may arise and create a nuisance to the local community. Past experience at existing disposal facilities within the Chicago District of the Corps of Engineers has shown that malodors are perceivable only for a short period after disposal operations cease and only very close to the actual disposal site in the facility. No abatement actions have yet been needed at Chicago District disposal facilities. In the future, however, malodors may possibly become a problem at both existing or new disposal facilities. Therefore, the Chicago District has developed a malodor abatement plan based upon research published in U.S. Army Engineers Waterway Experiment Station (1976) "Abatement of Malodors at Confined Dredged Material Disposal Sites." The objective of this malodor abatement strategy is to reduce the perceived intensity of malodors in the local community to acceptable levels, using acceptable techniques. There are a number of management actions that can be taken to achieve malodor abatement. Figure E-1 indicates the management strategies that will be implemented by the Chicago District should a malodor incident occur.

FIGURE F-1. ABATEMENT OF MALODORS AT CONFINED DISPOSAL FACILITIES (Chicago District, Corps of Engineers)



Source: U.S. Army Engineer Waterway Experiment Station. 1976. Abatement of malodors at diked, dredged materila disposal sites. Vicksburg, Miss.