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December 23, 1980
C 9400

Mason and Hanger
Silas Mason Company Inc.
1500 W. Main St.
Lexington, KY 40505

Attention: Dr. Harry J. Sterling

Re: Final Site Selection and Evaluation
for a Hazardous Waste Disposal Site

Gentlemen:

We are pleased to submit five (5) copies of the report, "Final Site Selection and Evaluation for a Hazardous Waste Disposal Site". This report supplements the report submitted to you on October 29, 1980, titled, "Preliminary Screening Assessment, Site Selection and Evaluation for a Hazardous Waste Disposal Site", per our contract agreement.

This final report evaluates the potential for hazardous waste disposal at the Browning-Ferris Industries (BFI) site, the CECOS (CER) - Williamsburg, Ohio site and on-site disposal and abatement alternatives at the Outboard Marine Corporation (OMC) property. The sites are evaluated from environmental, socio-economic and engineering points of view, with the major emphasis on the engineering aspects of the site.

If you have any questions or comments about the report, please contact us.

Very truly yours,

WARZYN ENGINEERING INC.

Daniel W. Hall

Daniel W. Hall, CPGS
Project Manager

DWH/dkp
[WEI 1-10]

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FINAL SITE SELECTION
AND EVALUATION FOR A HAZARDOUS
WASTE DISPOSAL SITE
C 9400

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FINAL SITE SELECTION AND EVALUATION
FOR A HAZARDOUS WASTE DISPOSAL SITE

INTRODUCTION

The purpose of this study was to perform final evaluations of potential disposal alternatives for PCB contaminated dredge material disposal. The sites considered in this final evaluation include the Browning-Ferris Industries (BFI) landfill site near Zion, Illinois, the Clermont Environmental Reclamation (CECOS) landfill site near Williamsburg, Ohio and the Outboard Marine Corporation (OMC) property. Location maps for these sites were submitted in a previous report, "Preliminary Screening Assessment, Site Selection and Evaluation for a Hazardous Waste Disposal Site", dated October 29, 1980.

The BFI and CECOS sites were selected for the final evaluation based on a preliminary screening assessment of several potential land disposal sites identified by USEPA and Mason Hanger-Silas Mason Company, Inc. At the OMC property, in-situ abatement of the PCB contaminated sediments was recommended by Warzyn Engineering Inc. Mason Hanger-Silas Mason Company, Inc., further recommended that alternative on-site disposal methods be evaluated, including landfilling and lagooning of the PCB contaminated sediments.

Each of these disposal alternatives is evaluated with respect to its environmental, socio-economic, engineering and transportation characteristics and the costs associated with the development and use of each site for PCB contaminated dredge disposal. This evaluation process identifies the sites with the greatest potential for development as a waste disposal facility. Furthermore, the report identifies what additional data is required to prepare detailed engineering design of each of the recommended sites in this final evaluation, and finally, the procedure

required for permitting the selected sites is presented. Mason Hanger-Silas Mason Company, Inc., has assisted in the final evaluation of the disposal alternatives evaluated in this report by providing Warzyn Engineering Inc., with specific data regarding the volume and concentrations of contaminated PCB sediments in the Waukegan Harbor area and on the OMC property that potentially need removal and disposal and/or abatement treatment.

Warzyn Engineering Inc., was authorized for this final evaluation investigation by Mason and Hanger-Silas Mason Company, Inc., by a subcontract agreement dated August 21, 1980. Mason and Hanger-Silas Mason Company, Inc., in turn, is contracted to USEPA, Region 5, to present results of this and other associated investigations regarding the OMC-Waukegan Harbor PCB contamination problem.

RESULTS OF PRELIMINARY SCREENING ASSESSMENT

The results of the preliminary screening process were presented in a report to Mason and Hanger-Silas Mason Company, Inc., titled "Preliminary Screening Assessment, Site Selection and Evaluation for a Hazardous Waste Disposal Site", dated October 29, 1980. The original scope of work outlined for the preliminary screening included four privately owned land disposal sites and three government owned sites to be considered for PCB contaminated sediment disposal. However, the site management of two of the privately owned sites (the C.I.D. landfill site in Cook County, Illinois and the Ottawa-Brockman Site-CECOS site near Ottawa, Illinois) eliminated their sites from the preliminary screening process, therefore, they were not considered in the assessment. In addition, two other privately owned landfill sites were preliminarily evaluated by telephone

inquiry, which included the Nuclear Engineering site in Sheffield, Illinois and the Waste Management, Inc., site in Livingston, Alabama. The OMC property was not considered in the preliminary screening assessment along with the other sites, as it was determined that it would undergo the final site evaluation, and therefore, did not need a preliminary screening. Each of the sites that were subjected to the preliminary assessment were evaluated on selected physical/environmental and socio-economic criteria, as outlined in the scope of work and included; topography, soils and bedrock; groundwater and surface water; site engineering and operations; haul distance to site, traffic patterns and neighborhood characteristics; and the acceptability and availability of each site as a PCB contaminated dredge material disposal facility. The data gathered to assess the sites was provided by the landfill site owners and/or their consultants and the appropriate government agencies.

As a result of the preliminary screening process, the following summary and conclusions were presented in the October 29, 1980 report by Waryzn Engineering Inc.:

1. The BFI site should be included in the final site evaluation for potential PCB contaminated dredge disposal at that site.

2. The CECOS site at Williamsburg, Ohio is conditionally recommended for the final site evaluation after a study is performed to determine the hauling costs to the site from the Waukegan Harbor Area relative to the anticipated costs of site development at other, closer sites, specifically, the BFI site.

3. We do not recommend that the Joliet Army Ammunition Plant, Fort Sheridan or Great Lakes Naval Base be considered in the final evaluation of the sites, based on the premise that the sites would have to be completely redeveloped from the initial feasiblity to the final engineering phases, which is costly and time consuming.

4. We recommend that the Sheffield, Illinois site (telephone inquiry) be further investigated at the preliminary screening level.

5. We do not recommend that the Livingston, Alabama site (telephone inquiry) be further investigated at the preliminary screening level, based on the haul distance to the site, while other, closer sites are available.

RESULTS OF FINAL SITE SELECTION AND EVALUATION

A. Browning-Ferris Industries (BFI) Site (Option 1)

1. Introduction

Presently, BFI operates a licensed hazardous waste disposal site on approximately 59 (of 70) acres in the NW 1/4, Section 7, T46N, R12E, Lake County, Illinois and is located about 12 miles from the Waukegan Harbor area by roadway distance. The site is presently not permitted to accept PCBs and would require licensing from both the State and Federal Governments to do so. An adjacent 74 acre expansion site is presently permitted for development by the IEPA, however, it does not yet have an operational permit.

2. Environmental Characteristics

a. Regional Setting

Topography in the vicinity of the site varies from nearly flat to gently rolling. Elevations typically range between 760 feet and 590 feet MSL, such that the ground surface slopes eastward toward Lake Michigan. The area is underlain by a series of glacial tills, comprising a total thickness of at least 200 feet. The tills are underlain by Silurian dolomite bedrock.

Groundwater typically ranges from 5 to 20 feet below ground surface in the vicinity of this site. Regionally, groundwater flow is eastward toward Lake Michigan in the dolomite aquifer and at depth within the glacial till formation, however, locally, groundwater flow is toward the Des Plaines River or it's tributary, or toward Lake Michigan. The area is somewhat poorly drained such that occasional marshy areas occur, particularly along Lake Michigan.

b. Site Hydrogeology

Topographic relief at the site is on the order of 30 feet, ranging from about 755 feet MSL in the northern portion of the site to about 725 feet MSL in the southwestern corner, which generally meets USEPA requirement of low to moderate relief.

Soil borings from the site indicate about 0.5 feet to 1 foot of dark, silty/clayey topsoil is underlain by about 5 feet of moderately plastic, silty clay (CL-CH), underlain by a brown to gray, low plasticity silty clay (CL) to a depth of at least 50 feet to 70 feet below ground surface (687 feet MSL). Interlayers up to 3 feet thick of silt (ML), clayey silt (ML-CL) and silty and clayey sand (SM-SC) occur in the clay soils. Apparently, a continuous layer of silt and sand extends east from the eastern border of the existing site under the adjacent 74 acre site, ranging from 2 feet to 15 feet in thickness, lying 40 feet to 60 feet below ground surface (690 feet to 718 MSL).

Constant head permeability tests on eight samples of the clay from depths ranging 20 feet to 42 feet below ground surface range from 1.9×10^{-6} to 1.1×10^{-8} cm/sec, averaging 4.3×10^{-7} cm/sec, while falling head permeability tests on eight samples from 20 feet to 32 feet

below ground surface at the proposed site indicate the range of 1×10^{-7} to 6×10^{-9} cm/sec, averaging 2.4×10^{-8} cm/sec. Cation exchange capacities of the clays are low (approximately 3 to 6 meq/100 grams).

The soils generally meet the thickness requirement of USEPA (4 feet) and Illinois EPA (10 feet). The soils generally meet the USEPA soil permeability requirement (1×10^{-7} cm/sec), however, marginally meet the Illinois EPA requirement (1×10^{-8} cm/sec). Recompaction of the clay soils could lower the permeability to 10^{-8} cm/sec or less. LL and PI were not measured as required by USEPA criteria. All samples tested of the silty clay exceed the USEPA 30% P200 requirement. USGS indicates this area is suitable for disposal of all wastes except mobile, unattenuated, hazardous substances.

Dolomite bedrock is located about 200 feet below ground surface. The dolomite is an important aquifer which is locally used as a source of drinking water.

Groundwater is reported to exist between 11 feet and 17 feet below ground surface at the existing site and 6 1/2 feet to greater than 12 feet below the proposed site. Groundwater flow direction was not reported, although flow direction is likely in a southerly direction. Depth to groundwater does not meet the USEPA requirement of at least 50 feet to the historical high water table below ground surface.

Judging from the topographic position of the landfill site, it may be in a local groundwater recharge zone, as it occupies a locally high topographic area and is surrounded by potential discharge points; Des Plaines River to the west, lowlands to the south and Lake Michigan to the east. According to USEPA requirements, a recharge zone should be avoided, however, because of the thick sequence of clay at the site, recharge

characteristics are probably minimal. Drinking water is obtained primarily from the dolomite bedrock aquifer. At least two private residences with deep wells are located along 9th Street at the southern boundary of the site; several other residences are also located within 500 feet of the site boundaries along 9th Street, which also may have private well water supplies.

No natural streams, ponds or lakes occur on this site. Topographically, the site appears to lie near a surface water divide, such that surface water west of the site drains toward the Des Plaines River and east of the site toward the Lake Michigan basin. Surface drainage across the site is reported to be predominantly west and south. The site is not located within the 100 year flood plain, however, standing water has apparently occurred in the past near the northern portion of the site, probably due to poor soil drainage characteristics of the clays.

c. Socio-Economic Profile of the BFI Site

When considering the environmental impact of a project on an area, it is important to also consider the qualities of that area in relation to the social and economic environment. Construction and operation of a new PCB disposal area or disposal at an existing solid waste disposal site will exert both short and long-term impacts on that environment. Short-term effects will result from transportation, construction and disposal activities, whereas long-term effects will result from leachate collection and abatement, and commitment of the landfill area to that use. The following section will briefly discuss disposal of the PCB waste at the Browning-Ferris Industries site and the relationship of selected socio-political criteria to that option.

Existing land use surrounding the BFI site can be described as rolling farm land and forest. A subdivision approximately 1/2 mile southeast from the site and several private residences are located in the surrounding vicinity but the population is sparse near the landfill site. Two other existing landfill sites are present nearby. These are the American Ad-Mixtures site and North Shore Sanitary District site.

There are several potential haul routes available from the OMC harbor area to the disposal site. The preferred route would utilize State highways and minimize travel through residential areas north of the Waukegan Harbor area. The route would follow Highway 132 (Grand Avenue) west 3 1/2 miles to Highway 131 and proceed north for 7 1/2 miles to Ninth Street, for a short distance to the Highway 131 entrance to the landfill site, or a total of about 12 roadway miles.

Disposal of the PCB wastes would not create additional employment opportunities at the landfill site, although additional employment would be necessary to excavate and remove the PCB wastes from the harbor area and/or the OMC property. It is expected that transportation of the waste material to the BFI site would provide employment for a local transporter of wastes. No jobs will be lost as a result of the disposal of the PCB wastes at the BFI site.

Since the BFI site is an existing landfill, no change in taxation or land use can be expected. There will be no additional burden on public facilities, such as schools, hospitals, police departments, fire departments, etc.

There is no local zoning ordinance that prevents PCB disposal at the BFI site. However, due to the emotional issue of uninformed landowners not wanting to live near a hazardous waste disposal area, public opposition can be expected to the proposal. The site owners do not expect that that local opposition will prevent the disposal of the PCB dredge materials at the site.

Browning-Ferris Industries has indicated willingness to accept all PCB waste volumes from the project but they do not want to accept only a small quantity of highly concentrated waste. PCBs have been disposed of at the site in the past. The Illinois Environmental Protection Agency has indicated that obtaining a supplemental permit to dispose of PCBs at the BFI site would be the simplest option to pursue.

3. On-Site Engineering Evaluation

On October 10, 1980, the Browning-Ferris Industries site (BFI), located in Zion, Illinois, was inspected to assess the operational performance of the facility. The comments contained in the following sections are based on that site inspection and on a review of the existing plans prepared to date that have been submitted to the Illinois EPA.

a. Field Confirmation of Suitability

The main purpose of the field inspection was to assess present operational methods and site conditions to determine if they would be conducive to disposal of PCBs. Factors evaluated included the following; access control to the facility; monitoring of wastes that enter the facility; residential development around the landfill site; subsoil and groundwater characteristics; monitoring well locations; handling of surface

water; control of dust; site construction and certification work; and overall operations and site monitoring. In general, based on the field inspection, this site appears to have potential for PCB disposal. However, as discussed later in this report, there are several areas that will need modification or improvement to allow disposal of PCBs.

b. Existing Engineering and Operational Features

This facility is designed to take municipal wastes and limited quantities of hazardous wastes. In the discussion of this facility, the existing site and proposed expansion site are considered as one site. It is known that certain modifications will be necessary to permit disposal of PCB contaminated material at this facility. Those modifications are discussed in the next section.

Base grades at the facility slope from Elevation 731 MSL in the west to Elevation 720 MSL in the east at approximately 1/2%. The base grades are designed so that a minimum of 10 feet of clay or till material exists above the sand lense that is present at depth in some areas of the facility, particularly in the expansion area. As areas of the site are excavated, shallow borings are performed to document the separation distance of 10 foot of clay or till material above any sand lense. The depth of excavation at the site to obtain base grades varies from 0 to 50 feet below existing ground throughout the facility. In general, the deeper excavations will be required in the expansion facility. The base grades are generally below the water table at the site.

The final grades reach a maximum height of 812' MSL in the central portion of the facility. From that crown, the final grades slope at approximately 5% in all directions. The sideslopes around the perimeter of the facility are designed at 5H:1V. The sideslopes tie into the perimeter core berm, which is constructed around the entire perimeter of the facility. This core berm is approximately 10 feet in height with 2:1 sideslopes and a 10 foot wide inner core of clay, and is constructed of clay with a permeability of 10^{-7} cm/sec, which does not meet IEPA regulations of 10^{-8} cm/sec. The maximum height to which final grades extend above existing ground is approximately 80 feet at the crown. In most areas of the facility, the final grades are 40 to 50 feet above existing ground. The final cover at this facility consists of 3 feet of on-site clay covered by 6 inches to 12 inches of topsoil.

This facility has no plans or provisions for leachate collection or removal.

The perimeter core berms serve to divert surface waters from entering the fill areas and apparently meet surface water diversion requirements per USEPA regulations. Ditches are to be constructed, as necessary, alongside roadways and perimeter core berms to handle surface water. Surface water entering the fill area is routed to the low spot in the fill area and pumped to the ditches.

A well-constructed access road leads from the entrance of the facility to the fill areas. Roads within the fill areas are constructed of on-site materials and graded periodically to maintain trafficability. Slopes and layout of the roads are sufficient to permit access to and from the fill areas.

Drawing C 9400-3 indicates the sequence of filling operations. In general, filling has progressed from the north to the south. Present fill operations are occurring in the southeast corner of the existing site. Subsequently, operations will progress westward to the L-shaped section of the existing site. Fill operations in the expansion facility are to progress from north to south. In both areas, filling is accomplished by the area method. Cover materials are excavated from future fill areas, and utilized for daily cover with excess material stockpiled for use as final cover. As a condition of approval, the facility must maintain a 100 foot certified base grade section in advance of the working face. Base grade certification consists of a series of shallow soil borings (10 feet) to verify that clay or till is present to a 10 foot depth. Any coarse grained lenses encountered as a result of the borings are excavated and backfilled to attain the required separation distance.

The existing site has three monitoring wells located as shown on Drawing C 9400-3. In general, Monitoring Well #1 is located in the northeast corner of the existing facility, Montoring Well #2 is located in the southwest corner, and Monitoring Well #3 is located on the west central side of the site. As part of the construction of the expansion site, Monitoring Wells 4 through 7 will be added around the eastern and southern perimeters of that facility. According to well construction details, the wells apparently meet USEPA requirements. A water quality monitoring program does exist at this facility, but may require some modification to satisfy USEPA requirements regarding parameters for PCB disposal.

A short segment of gas venting trench is to be installed in the southeast portion of the facility. This gas venting trench is to be installed when any structures are completed within 500 feet of the filled area. In addition to the venting trench along the southeast corner of the facility, numerous gas vents are indicated on the proposed final layout of the filled area. The gas vents consist of a 4 inch diameter vent pipe surrounded by a 2 foot diameter gravel envelope installed approximately 20 feet below the final cover.

c. Modifications to Comply with PCB Disposal

The Illinois EPA and USEPA have several requirements regarding the construction and operation of disposal facilities for PCB materials. In addition, requirements are being drafted under the Resource Conservation and Recovery Act (RCRA) regulations that may alter the present regulations. Some of the present written regulations do not account for recent developments in landfill construction. Some of the indicated modifications for this facility go beyond the requirements of current regulations but are consistent with State of the Art practice. The following paragraphs discuss the modifications necessary to upgrade this facility to permit disposal of PCB materials. Two options (1A and 1B) are proposed for this facility, but, the following discussion is pertinent to both.

Option 1A consists of putting the waste partly above and partly below the ground (see Drawing C 9400-4), while Option 1B places the waste almost entirely below the ground (see Drawing C 9400-5). The options are located in different areas of the BFI site, and the difference in the engineering reflects the existing or proposed base grades for the respective locations of either Options 1A (existing site) or 1B (expansion site).

As indicated, Illinois EPA requires 10 feet of clay with a maximum permeability of 10^{-8} cm/sec below PCB disposal facilities. USEPA requires 3 to 4 feet of clay with a maximum permeability of 10^{-7} cm/sec beneath such a facility. The BFI facility is constructed over at least 10 feet of clay or till material. Additional testing will be necessary to document the permeability of the in-place clay at the site and its' recompaction characteristics, its' suitability for constructing a liner and/or using the clay in place in lieu of a liner. Based on available data, it appears that this material could be recompacted to comply with the 10^{-8} cm/sec permeability requirement. To comply with USEPA requirements, a liner system incorporating primary and underdrain leachate collection systems has been developed for this facility. This liner system is detailed on Drawings C 9400-4 (Option 1A) and 5 (Option 1B). The liner system consists of a 6 inch granular blanket which is covered by a filter cloth to minimize the infiltration of fine particles into the granular blanket. A perforated PVC pipe is installed within a granular backfilled trench below the granular blanket to collect and route leachate to a withdrawal point. The leachate collection lines lead to a series of manholes from which the leachate could be withdrawn. The leachate collection line is underlain by 4 1/2 feet of recompacted clay which, in turn, is successively underlain by an impermeable membrane, 6 inches of recompacted clay, and a 12 inch granular blanket, which would collect liquid material that penetrated the initial liners. This granular material leads to the underdrain leachate collection system. This underdrain leachate collection system is routed to another leachate collection withdrawal point. This underdrain system is underlain by a 2 foot recompacted clay liner. Beneath the 2 foot recompacted clay liner would be a minimum of 3 feet of existing clay or till.

This lining system and the leachate collection system are major modifications required at this facility. However, any facility designed to dispose of these wastes would have similar systems. Drawings C 9400-4 and 5 indicate the plan view layouts of the leachate collection systems.

Base grades slope toward the leachate collection lines at a minimum of 1%. Inward side slopes of the facility would be 2H:1V, constructed of recompacted clay to a thickness of five feet. The overall clay or till thickness on the sidewalls would be 10 feet with 5 feet of the thickness being in-place material.

The present surface water handling system for water outside the perimeter of the disposal facility is consistent with current requirements with regard to PCB disposal. However, any surface water that is in contact with the waste material should be treated as contaminated water and routed to the leachate collection systems. This is another modification required at this facility.

If PCBs were disposed of at this facility, a separate area would be constructed to separate them from other waste materials. In discussions with BFI personnel, they have indicated that they are willing to do this. An CB disposal area would be operated independently of other waste areas and promptly covered to minimize potential environmental damage.

The USEPA requires that groundwater be monitored from a minimum of three sample points on a routine basis. This facility complies with those requirements. However, based on a review of the hydrogeology of the facility and the locations of existing and proposed wells at the site, it also may be desirable to install additional wells to separate the effects of the existing facility on groundwater from the potential effects of PCB disposal.

The proposed gas venting system would be adequate, since limited gas is expected to be generated from the PCB disposal facility. The exact location of the PCB facility, when constructed, would dictate the gas venting requirements.

The final grades for the facility appear sufficiently sloped to minimize surface water infiltration into the site, thereby minimizing leachate production. A modification, which would further minimize infiltration through the surface of the landfill, would be the installation of an impermeable membrane in conjunction with the clay final cover. This impermeable membrane would be keyed into the impermeable membranes installed on the sideslopes and base grades.

In summary, the main modifications required at this facility would be the installation of a modified liner and leachate collection systems, and the modification of surface water handling practice. Leachate would require disposal either at a wastewater treatment facility or at an on-site treatment facility. In addition, contingency plans, operational plans, long-term care and monitoring plans would be required to address provisions to monitor the integrity of this facility for the future.

4. Transportation Methods

As mentioned earlier, the BFI disposal facility is located approximately 12 miles from the Waukegan Harbor area. The contaminated material might be transported via modified dump trucks. The dump trucks would be required to have a sealed tailgate with a flexible cover over the loads, with the boxes of the vehicles tight to prevent the leakage of contaminated material along the roadway. Thus, a main factor determining the transportation requirements of this material would be the water content

and characteristics of the material to be transported. In any event, the vehicles utilized for transportation should be routinely inspected for compliance with the requirements.

The vehicles would be loaded using standard earthmoving equipment such as end loaders. Before the vehicles leave the loading area, they would be cleaned of any excess material not contained within the box, on the outside of the boxes and other parts of the trucks. The loading would be done in an area secured to minimize contamination from the loading operation.

The route utilized to transport the material to the disposal facility should be located to minimize exposure areas that have a high density of people.

5. Summary of Costs

We evaluated two different options for disposal of PCB material at the BFI facility; Option 1A consists of placing the material approximately 10 feet below existing ground and 20 feet above existing ground and would be located in the western portion of the existing facility. Option 1B involves placing the material below existing ground and would be located in a portion of the expansion area, as shown on Drawings C 9400-3, 4 and 5. The basic construction features, including the lining and leachate collection systems, would be the same for both options. The major factor that effects the cost difference between the two options is the additional excavation required of Option 1B (see Table 2). Otherwise, neither site has a significant cost or environmental advantage over the other.

The following cost summary has been divided into several categories. Those categories are; user costs, site preparation costs, operation and maintenance costs, site closure costs, and long-term costs. A detailed breakdown of this cost analysis is included in Appendix A for reference.

a. User Costs

User costs consist of the fees that would be charged by the owner/operator of the disposal facility to dispose of the waste at their facility. The Regional Director of Sales for BFI, George Edema, quoted transportation and disposal costs of PCB contaminated materials at the facility at $50 per cubic yard. This quote includes the required modifications to the facility, including installation of leachate collection system, a liner system, contingency plans, leachate collection and treatment costs, etc. The quote for transportation and disposal was based on a minimum disposal yardage of 200,000 cubic yards. The present estimated yardage requiring disposal is 367,000 cubic yards.

TABLE 1
USER COSTS FOR BFI SITE

Transportation Costs (assumed $10 per cubic yard)	$ 3,670,000
Disposal Costs	$14,680,000
Total User Costs	$18,350,000

b. Site Preparation Costs

Costs to construct a facility (Options 1A and 1B) to dispose of the PCB contaminated materials in compliance with current regulations were evaluated (see Appendix A). Costs are included for both options of disposal at the BFI facility. The factors included in the site preparation costs are as follows: excavation; placement of granular blanket and recompacted clay liners; installation of leachate collection system, underdrain system, filter cloth, and impermeable membrane liner; stripping topsoil; construction of drainage swale; and miscellaneous work.

TABLE 2
SITE PREPARATION COSTS - BFI

Option 1A	$1,365,000
Option 1B	$1,573,000

c. Operation and Maintenance Costs

Operation and maintenance costs are incurred in the day to day operation of the facility. Such costs include personnel, equipment operation and purchase, recordkeeping, water quality monitoring, and leachate collection and treatment. The operation and maintenance costs for both options is $350,000 per year. This is assuming that disposal of the wastes will be completed in one year.

d. Site Closure Costs

Site closure is the work associated with abandoning the facility when it has completed its operations. These costs include: the placement of final cover; seeding, fertilizing and mulching; placement of the PVC liner; installation of gas venting trenches; and miscellaneous work.

TABLE 3
SITE CLOSURE COSTS - BFI

Option 1A	$422,000
Option 1B	$424,000

e. Long-Term Care Costs

Long-term care includes the annual inspections and maintenance work necessary after the site has been abandoned to maintain its integrity and its function. Such costs include site inspections, site grading, seeding to replace eroded areas, leachate collection and treatment, water quality and gas monitoring, and recordkeeping. The costs for long-term care are the same for both options, which totals approximately $112,000.

f. Cost Summary

The following table summarizes the costs associated with the BFI facility.

TABLE 4
COST SUMMARY - BFI

	Option 1A	Option 2A
Site Preparation	$1,365,000	$1,573,000
Operational Costs	$ 350,000	$ 350,000
Site Closure	$ 422,000	$ 424,000
Long-Term Care	$ 112,000	$ 112,000
Total Cost	$2,249,000	$2,459,000

User Fee	
Transportation	$ 3,670,000
Disposal	$14,680,000
Total Cost	$18,350,000

WARZYN ENGINEERING INC

6. Summary - BFI Site

The BFI site has potential for disposal of PCB contaminated material. The physical/environmental and socio-economic characteristics of the site have been determined suitable for PCB disposal at the site, based on the findings of the preliminary screening assessment. The strongest points in favor of disposal at BFI are:

1. Favorable soils for site development.
2. Close proximity to the waste source.
3. Sparse population in the vicinity of the site.
4. Good transport access to the site.
5. The site management is willing to accept the waste.

Further, from an engineering viewpoint:

1. The facility appears suitable for modification with no special problems to comply with current regulations and standard disposal practice.
2. Disposal at the site is cost effective compared to disposal at the CECOS-Williamsburg, Ohio site, as discussed later.

Additional investigations that are required before further conclusions can be made regarding detailed engineering include:

1. Determining soil characteristics beneath proposed fill areas, specifically permeability as it relates to recompaction of the soils for liner construction.
2. Infield permeability testing of the soils to determine their use as in-place liner material.
3. Determining the existing groundwater characteristics of the site to develop the groundwater monitoring program, utilizing existing (and proposed) wells.
4. Further determining when, and what, quantities of PCB contaminated materials will be available, as well as determining the respective concentrations of PCB, such that a decision can be made as to what options at this facility might be most appropriately used.

B. CECOS (CER) - Williamsburg, Ohio Site - Option 2

1. Introduction

In the recommendations from our preliminary screening assessment at the various sites, we indicated that the CECOS site was conditionally recommended based on a comparison of costs for hauling the PCB contaminated dredge materials from the harbor area to the CECOS site as opposed to the development of closer sites, specifically the BFI site. This comparison is made below and it indicates that the cost of hauling the PCB contaminated dredge materials to the CECOS site is extremely costly. Furthermore, the cost for disposal of the contaminated sediments at the CECOS site is almost twice that of the disposal costs at the BFI site, based on disposal rates supplied by their respective site managers. Because of this situation and our recommendations, the level of detail concerning some of the information about the CECOS site, other than the summary of costs, is somewhat briefer than other disposal alternatives.

2. Environmental Characteristics

a. Site Hydrogeology

Topographic relief at the site is about 35 feet, with elevations ranging from about 879 feet MSL adjacent to Pleasant Run Creek (southwest) to about 913 feet MSL (northeast). Present and proposed disposal areas are located in a fairly flat area and meet USEPA requirements of low to moderate relief.

The general geology of the site is such that about 6 to 8 feet of a gray brown silty clay (CL) is underlain by about 40 feet of a gray-brown sandy clay till (SC, SC-SM), which in turn, is underlain by interbedded shale and limestone. In the western portion of the site, discontinuous sand seams are present about 25 feet to 30 feet below grade, however, in

the eastern portion of the site, a continuous sand seam on the order of 5 feet thick that can be generally traced over a 20 acre area, where the new secured landfill cells are to be developed. The clay soils meet thickness requirements of USEPA (4 feet) and OEPA (25 feet).

Soil tests indicate that silty clay and clay till soils generally have permeabilities less than 1×10^{-7} cm/sec, meeting requirements of USEPA and conditionally meeting those of OEPA. Average properties of the surficial silty clay indicate: 70% P200, LL, 38% and PI, 20%, all meeting requirements of USEPA. Analysis of the clay till indicates: 30-50% P200, LL, 15-20% and PI, 5-7%. The P200 content meets USEPA requirements, however, the LL and PI do not. Permeability of the sand and gravel is approximated at 10^{-2} to 10^{-5} cm/sec, based on grain size analyses.

The interbedded limestone and shale bedrock lies approximately 50 feet to 60 feet below the ground surface. This rock formation yields little water, however, small quantities may percolate through fractures and in the weathered zone.

Depth to groundwater in the northern portion of the site is generally within 2 feet of the ground surface, while it varies from about 2 feet to 20 feet in the southern portion and from 2 feet to 7 feet in the western area; this does not meet the USEPA requirements of 50 feet to historical high water table below the base of the site or OEPA requirement of 5 feet below ground surface in certain areas.

Groundwater flows generally in a southerly direction toward the East Branch and southwestward toward Pleasant Run Creek, which are local discharge points. Vertical hydraulic gradients are generally slightly upward, however, are seasonally downward during recharge events, based on water levels from nested wells at the western and northeastern portions of

the site. In the northern portion of the site, vertical hydraulic gradients are steeply downward in the vicinity of the pumped wells, in response to the pumping. Apparently, there is little hydraulic connection between the groundwater flow systems in the soils and in the underlying bedrock, however, there appears to be good hydraulic connection within the bedrock formation.

Apparently, six residences exist at the western boundary of the site which are on private water supply. Apparently, these residences are now owned by CECOS.

Pleasant Run Creek and its East Branch tributary generally flow in a southerly direction into the east fork of the Little Miami River. Pleasant Run Creek flows south through the property, just west of the secured landfill cells. The East Branch flows along the southeastern boundary of the site and joins Pleasant Run at the southwestern corner of the site. The site is not located within an established flood prone area, however, the streams exhibit flash-flood characteristics.

b. Socio-Economic Profile of the CECOS Site

The following section will briefly discuss disposal of the PCB waste at the CECOS site and the relationship of selected socio-political criteria to that option.

The CECOS Landfill site and vicinity is zoned agricultural. The rural setting is characterized by sparse farm and non-farm residents. Access to the site is via Aber Road, which is a very narrow local road. Transportation of the PCB wastes from the Waukegan area to the CECOS site would involve about 350 miles of travel. The most likely route from the Waukegan Harbor area to the landfill site would be I-294 south to Gary,

Indiana, then southeast on I-65 to Indianapolis, then southeast on I-74 to I-275 in the Cincinnati area. Transportation over these interstate routes would not impact residential areas adversely.

Disposal of the PCB wastes at the CECOS site would not require hiring of additional personnel at the landfill although additions of employees would be required at the OMC site and Waukegan Harbor to excavate and remove the PCBs. It is not anticipated that any personnel would lose job positions which they currently hold as a result of disposal of the PCB wastes at the CECOS site.

Since the CECOS site is currently licensed to accept PCB wastes, no change in taxation or land use plans are anticipated. Exercising this disposal option will not add additional staff to the CECOS facility and there will be no change in existing disposal practices. Therefore, public support facilities such as schools, hospitals, police departments, fire departments, etc. will not be impacted.

The management of the CECOS site has indicated a willingness to accept all volumes of PCB waste generated in the clean-up operations. The site currently complies with the Federal Register 40 CFR 761 which allows them to receive 50 to 500 ppm PCB contaminated waste.

3. On-Site Engineering Evaluation

a. Existing Engineering and Operational Features

The CECOS-Williamsburg, Ohio facility is presently licensed to accept a wide variety of hazardous wastes, including PCB materials. A general layout of the facility is shown on Drawing C 9400-6. Since this facility is currently licensed to dispose of PCB materials, it has some of the modifications necessary to accept this hazardous waste as required by USEPA and Ohio EPA regulations.

The site is engineered with a multi-liner system, leachate withdrawal and monitor underdrain. The base of the landfill consists of 5 feet of recompacted clay overlain by an impermeable synthetic membrane liner, which is overlain by 2 feet of uncompacted clay as a protective layer. The membrane liner is also placed over 5 feet of recompacted clay till on the side slopes and ties into another membrane liner, which is placed over the waste as part of the final cover. Overlying the final cover membrane liner is 3 feet of clay material and 2 feet of final cover soil. Beneath the 5 foot clay liner is a 6 inch sand layer, which ties into the monitor underdrain system. The underdrain system serves as a secondary leachate collection system. The primary leachate collection system, which is installed on the base grades, consists of a perforated 24 inch diameter concrete standpipe into which leachate may flow. Leachate levels are not monitored or pumped on a routine basis, however, leachate is pumped from the cells on a periodic basis to maintain levels 2 feet below original grade. Presently, the leachate is pumped into a holding basin until a sufficient quantity is collected for treatment. The leachate treatment consists of pumping the leachate onto the top of the daily cover in an adjacent secured landfill cell, into which a chemical agent is added to solidify the leachate. The solidified leachate is then placed back into one of the secured landfill cells.

The design concept for disposal at the site is to develop individual secured landfill cells under dry disposal conditions. Within each cell, berms are used to separate incompatible waste types from each other.

Presently, the entire site is not fenced and access to the gate house and other site facilities is not controlled. However, each secured landfill site is fenced, which may meet USEPA requirements.

Because this site is a licensed facility, it is assumed that it complies with all USEPA and OEPA regulations regarding the daily operations and record keeping associated with PCB disposal. Daily site operations also include the visual inspection of individual loads as they come into the disposal site. However, only minimal laboratory tests are performed on the wastes to determine their chemical characteristics.

Traffic routing within the facilities is difficult for semi-trucks and other large trucks requiring access to the disposal areas. The modules are fairly small, and when they are divided into three different areas by the use of berms, there is little room for maneuverability for trucks to unload.

The facility has numerous monitoring wells (32) throughout the property. However, based on the actual location of the disposal facility, additional monitoring wells may be required to effectively monitor groundwater quality. The facility is monitored on a routine basis for water quality. The facility has gas venting systems for the secured landfill cells. In general, the facility complies with the regulations but would need limited upgrading to be in full compliance and to meet industry standards.

Surface water is diverted from entering cell areas per regulations for sites located above the flood plain. Surface water that falls into the cell areas is either treated as leachate or pumped to a surface water drainage system. The surface water in the cell areas is monitored for quality which determines the method of deposition of the surface water.

b. Modifications to Comply with PCB Disposal

Based on the site characteristics and design plans reviewed to date, some modifications are recommended to permit this facility to handle the PCB contaminated materials. The liner system would be modified to include a 6 inch granular blanket on top of the first 2 foot recompacted clay layer. This granular blanket would lead to a leachate collection system installed in the 2 foot clay material. This leachate collection system would replace the standpipe leachate collection system that presently exists at the site. Drawing C 9400-7 indicates a proposed detail of the liner system and a plan view of the location of the leachate collection system. The surface water handling system would be modified so any water in the cell area would be treated as leachate.

The underdrain system currently used would be modified so the granular material would be continuous underneath the site and the risers utilized to gain access to the underdrain system would be replaced with manholes.

This facility should have adequate contingency plans, operational and maintenance guidelines, etc. on file for the existing disposal operations. The main modifications would be the addition of a granular blanket to the lining system and the installation of a primary leachate collection system.

4. Summary of Costs

The following cost summary has been divided into several categories. Those categories are; user costs, site preparation costs, operation and maintenance costs, site closure costs, and long-term care costs. A detailed breakdown of this cost analysis is included in Appendix B for reference.

a. User Costs

The user cost is the fee that the operator of the facility would charge for disposing of the PCB contaminated material at his facility. Mr. Wayne Aldridge, Technical Director, CECOS, indicated their costs for disposal of this material would be $90 per cubic yard. In addition, they indicated their transportation costs for this material would be approximately $1300 per truckload from Waukegan to their disposal facility with each truckload hauling approximately 20 to 23 cubic yards of PCB contaminated materials. Therefore, the transportation costs for this material would be approximately $65 per cubic yard. Based on a volume of 367,000 cubic yards of PCB contaminated material, the disposal fee would be $33,030,000 and the transportation fee $23,855,000 for a total cost of $56,885,000.

b. Site Preparation Costs

The costs to construct a facility according to the proposed layout shown on Drawing C 9400-7 were evaluated (Appendix B). The following work elements were included in the site preparation costs for this facility; excavation, stripping topsoil, placement of recompacted clay liner, granular blankets, impermeable membrane liner, leachate collection system, underdrain system, drainage swales, filter cloth, and miscellaneous work. The estimated costs for this work is $1,162,000.

c. Operation and Maintenance Costs

Operation and maintenance costs are the costs incurred in the day to day operation of the facility. Factors included in this cost are; personnel, equipment, water quality monitoring, and leachate collection and treatment costs. The operation and maintenance cost is $350,000. This assumes the disposal operation would be completed within a one-year period.

d. Site Closure Costs

The site closure costs are the costs associated with abandoning the facility after it has reached its design capacity. Costs included in this are final cover placement, seeding, fertilizing and mulching, installation of impermeable membrane liner and gas venting system and miscellaneous. The estimated cost for this work is $323,000.

e. Long-Term Care Costs

Long-term care includes the maintenance and inspection of the facility after it has been abandoned to maintain its integrity and function. Work elements that need to be performed during that time would be site grading, seeding to repair erosion areas, water quality monitoring, gas monitoring, leachate collection and treatment, and record keeping. The cost for these activities is $112,000.

f. Cost Summary

The following table summarizes the costs associated with the CECOS facility.

TABLE 5
COST SUMMARY - CECOS

Element	Cost
Site Preparation	$ 1,162,000
Operational Costs	$ 350,000
Site Closure	$ 323,000
Long-Term Care	$ 112,000
Total Cost	$ 1,947,000
User Fee	
Transportation	$23,855,000
Disposal	$33,030,000
Total Cost	$56,885,000

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5. Summary - CECOS

As determined from the preliminary screening assessment of the alternative sites, this site is somewhat favorable for disposal because it is already licensed. Its' hydrogeological environment and engineering design were shown to be generally acceptable from our preliminary screening assessment. However, the site is highly unfavorable because of the extreme haul distance and associated costs. In addition, we have shown that the disposal fee at this site is roughly twice that of the closer, BFI site. Therefore, we do not recommend this site for disposal of the PCB materials, unless all other alternatives become unfeasible.

It has been shown that minor modifications to the existing engineering plan should be implemented, particularly upgrading of the leachate collection system. It is already a licensed site and apparently meets USEPA and OEPA requirements.

C. OMC Site

1. Introduction

Since the contamination problem considered in this report originates on the OMC property and nearby Waukegan Harbor, it is a necessary and reasonable to address the following:

1. Potential in-situ abatement alternatives to the contamination problem at the OMC property,

2. On-site disposal alternatives at the OMC site because of the proximity of the contamination to the OMC property and the high costs involved with off-site disposal of the PCB contaminated sediments, or

3. Combinations of 1 and 2, above.

Therefore, the following alternatives have been identified which could be implemented at the OMC property and are a part of this final evaluation process:

1. Option 3 - Total on-site excavation and disposal in parking lot.

2. Option 4 - Parking area disposal and slurry cutoff wall around crescent-shaped ditch and oval lagoon.

3. Option 5 - Coke plant storage lagoon, parking area disposal and slurry cutoff wall abatement.

4. Option 6 - Slurry cutoff wall in the north ditch area and lagoon storage for harbor dredge materials.

5. Option 7 - Disposal of all contaminated materials in lagoons at coke plant location.

These options are discussed below as individual alternatives, with cost estimates calculated for the development of each. The options are illustrated in Drawing C 9400-8 through C 9400-14.

Six very important points should be mentioned at the onset of this OMC discussion:

1. The particular alternatives that deal with in-situ treatment (as opposed to complete or temporary removal of the PCB contaminated soils) place the emphasis on correcting the problem at the site, and all the regulations regarding PCB disposal at landfill sites may not necessarily apply to the type of abatement procedures we have proposed in these alternatives. Nonetheless, we have attempted to be conservative in our conceptual approach to abatement of the PCB problem. Further, our engineering safeguards used in the abatement concepts are commensurate with those proposed by IEPA and USEPA for landfilling of PCBs.

hazardous waste at the present.

ently, there is no local zoning or ordinance ents PCB disposal at the BFI site. It is not by site ownership that local opposition could he disposal of PCB dredge materials at the hough it is expected that some public opposi- d likely occur.

anticipated life of the existing site is an- to be about 8 years, while that of the pro- dfill is expected to be about 22 years based rent rate of refuse received at the existing proposed site has a design capacity for compacted cu.yds of refuse. Proposed gate een quoted as $50 per cubic yard, however, is l upon degree of required site modifications edge material disposal.

4. The site does not have a leachate collection system, which does not meet USEPA requirements; several onsite engineering modifications are likely necessary to facilitate PCB disposal. The site has good daily operations, based on our onsite visitation.

5. The disposal site is located relatively close to the Waukegan Harbor area with good access to the site; land useage and sparce population in vicinity of disposal site are favorable conditions.

6. BFI site will accept all concentrations and quantities of PCB dredge materials; the site is presently licensed to accept hazardous waste.

OS management has indicated that they are to accept all concentrations and quantities of ge materials that are delivered to the site. has historically handled small amounts of is presently permitted by OEPA and USEPA for osal in secure landfills four/five. Local as the CECOS Site named as a non-conforming under the zoning plan of May 11, 1972; this emains until review by the Clermont County leas Court in 1981.

jected site life is expected to be about 15 to , at a rate of one secured landfill cell per urrent prices for PCB material is $60 per drum r cubic foot; CECOS management indicates that ices are negotiable.

1. Site has low to moderate topographic relief which meets USEPA requirements.

2. Onsite clay soils generally met USEPA and OEPA thickness requirements of 9' and 25', respectively; onsite clay soils generally meet USEPA requirements for permeability, but only marginally meet OEPA requirements. Surficial clay soils (6-8' thick) meet USEPA requirements for P200 content and Atterburg limits, while underlying clay till soils meet P200, but, not Atterburg limit requirements.

3. Depth to groundwater does not meet USEPA requirements, and in certain areas, OEPA requirements. Groundwater discharge points (streams) are located on and adjacent to disposal property. The streams apparently have flash flood characteristics, but, the site is not in a flood prone area.

4. The site is presently designed and operated to accept PCB materials. Large trucks may have problems with maneuverability within the disposal area.

5. Haul distance to the site from the Wuakegan Harbor area is very far. Land useage and sparse population in the vicinity of the landfill site are favorable conditions.

6. CECOS site will accept all concentrations and quantities of PCB dredge materials. The site is presently zoned a nonconforming use.

TABLE 1

PRIVATELY OWNED DISPOSAL SITES

SITE SELECTION AND EVALUATION FOR
A HAZARDOUS WASTE DISPOSAL SITE

WARZYN ENGINEERING INC	DRAWN JDP	SCALE —	SHEET 1 OF 2
	CHECKED DRV	DATE 10-29-80	DRAWING NO C 9400-1
	APPROVED David W. Hall		
	REFERENCE		PRINTED OCT 30 1980

-ENVIRONM

NDWATER AND ' OF SITE ES

water is reported tidustries is
round surface at the trations of
than 12' below the d from the
direction was not e, which is
s likely in a southeposal. How-
does not meet the pt a small
to the historical erial, but,
ace. centrations.

g from the topograph previously
it may be in a locental permit
occupies a locallsupplemental
ounded by potentia is licensed
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the east. Accordin
zone should be avoir ordinance
sequence of clay It is not
tics are probably mition could
d primarily fromials at the
t least two privatilic opposi-
ocated along 9th
the site; several
also located within site is an-
9th Street, whichof the pro-
supplies. years based
he existing
ural streams, ponds spacity for
graphically, the sibposed gate
water divide, such however, is
drains toward the difications
site toward the
nage across the s
y west and south.
100 year floodpla
pparently occurred
tion of the site.

SUMMARY

1. Site has low to moderate topographic relief, which meets USEPA requirements.

2. Onsite clay soils generally meet USEPA and IEPA thickness requiremtns of 4' and 10' respectively. Soils meet USEPA requirements for permeability and P200 content; soils only marginally meet IEPA requirements for permeability.

3. Depth to groundwater at the site does not meet USEPA requirements. The site is not located in the 100 year floodplain.

4. The site does not have a leachate collection system, which does not meet USEPA requirements; several onsite engineering modifications are likely necessary to facilitate PCB disposal. The site has good daily operations, based on our onsite visitation.

5. The disposal site is located relatively close to the Waukegan Harbor area with good access to the site; land useage and sparce population in vicinity of disposal site are favorable conditions.

6. BFI site will accept all concentrations and quantities of PCB dredge materials; the site is presently licensed to accept hazardous waste.

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to groundwater in tat they are
s generally within quantities of
ries from about 2' to the site.
from 2' to 7' in amounts of
et the USEPA requirend USEPA for
water table below tlive. Local
ement of 5' below gron-conforming
, 1972; this
rmont County
water flows generall
ward the East Br
sant Run Creek, whi about 15 to
rtical hydraulic grcill cell per
slightly upward, hc $60 per drum
ring recharge eventsidicates that
wells at the wester
ne site. In the nc
cal hydraulic gradier
nity of two pumped
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between the groundwa
in the underlying b
be good hydraulic con
ion.

1. Site has low to moderate topographic relief which meets USEPA requirements.

2. Onsite clay soils generally met USEPA and OEPA thickness requirements of 9' and 25', respectively; onsite clay soils generally meet USEPA requirements for permeability, but only marginally meet OEPA requirements. Surficial clay soils (6-8' thick) meet USEPA requirements for P200 content and Atterburg limits, while underlying clay till soils meet P200, but, not Atterburg limit requirements.

3. Depth to groundwater does not meet USEPA requirements, and in certain areas, OEPA requirements. Groundwater discharge points (streams) are located on and adjacent to disposal property. The streams apparently have flash flood characteristics, but, the site is not in a flood prone area.

4. The site is presently designed and operated to accept PCB materials. Large trucks may have problems with maneuverability within the disposal area.

5. Haul distance to the site from the Waukegan Harbor

ʌIENT

LIAMSBURG SITES

SOCIOECONOMIC CRITERIA

CES TO SITE, TTERNS &) CHARACTER	ACCEPTABILITY AND AVAILABILITY OF SITE - OWNERSHIP AND ORDINANCES	SUMM
located about 12 miles from y roadway distance. Several lable from the Harbor area wever, the preferred route ay 132 (Grand Avenue) west lighway 131 for about 7 1/2 it is only a short distance ıtrance of the landfill site. because it minimizes travel north of the Waukegan Harbor nd Winthrop Harbor, and the highway system, which would of the waste to the disposal disposal site with respect ea is a favorable condition. and vicinity is presently sidential. The land can be land and timberlands. Land the site boundaries includes ıdfill sites to the east, ɔrth Shore Sanitary District), located approximately 1/2 ɔ Harbor) and several private th Street and Green Bay Road. sparse in the vicinity of the apparently in an area that is al of PCB with respect to the nt parcels. The sparse pon- the landfill site is also a ided that urban growth from ot spread further westward. ied archeological or histor- ved natural settings located disposal site.	The management of Browning Ferris Industries is willing to accept the volumes and concentrations of PCB which could potentially be excavated from the Waukegan Harbor area at their existing site, which is presently licensed for hazardous waste disposal. However, BFI does not want to simply accept a small quantity of highly concentrated PCB material, but, will accept the entire quantity of all concentrations. Some PCB dredge materials have been previously disposed of at the BFI site under a supplemental permit issued by Illinois EPA. Apparently, this supplemental permit has expired. The existing BFI site is licensed to accept hazardous waste at the present. Presently, there is no local zoning or ordinance that prevents PCB disposal at the BFI site. It is not expected by site ownership that local opposition could prevent the disposal of PCB dredge materials at the site, although it is expected that some public opposition would likely occur. The anticipated life of the existing site is anticipated to be about 8 years, while that of the proposed landfill is expected to be about 22 years based on the current rate of refuse received at the existing site. The proposed site has a design capacity for 5,800,000 compacted cu.yds of refuse. Proposed gate fee has been quoted as $50 per cubic yard, however, is conditional upon degree of required site modifications for PCB dredge material disposal.	1. Site has low to moderat meets USEPA requirement 2. Onsite clay soils gen thickness requiremtns c Soils meet USEPA requir P200 content; soils requirements for permea 3. Depth to groundwater USEPA requirements. Th the 100 year floodplain 4. The site does not have tem, which does not me eral onsite engineerin necessary to facilitat has good daily operat visitation. 5. The disposal site is the Waukegan Harbor ar site; land useage and s of disposal site are fa 6. BFI site will accept al ties of PCB dredge mate licensed to accept haza
the landfill site from the about 350 miles; this long ı favorable condition for dis- e most likely route from the dfill site would be: I-294, then southeast on I-65 to ıeast on I-74 to I-275 in the traffic from I-275 to Aber r, Aber Road is a very narrow and vicinity is zoned agricul- ıt suited for farming; the area ealize any significant urban rural setting is characterized farm residents and a township people. teristics include incomes that county mean; low to moderate rporated villages with no ıe dwellings without plumbing	CECOS management has indicated that they are willing to accept all concentrations and quantities of PCB dredge materials that are delivered to the site. The site has historically handled small amounts of PCB and is presently permitted by OEPA and USEPA for PCB disposal in secure landfills four/five. Local zoning has the CECOS Site named as a non-conforming use item under the zoning plan of May 11, 1972; this status remains until review by the Clermont County Common Pleas Court in 1981. Projected site life is expected to be about 15 to 20 years, at a rate of one secured landfill cell per year. Current prices for PCB material is $60 per drum or $8 per cubic foot; CECOS management indicates that these prices are negotiable.	1. Site has low to moder meets USEPA requiremer 2. Onsite clay soils g thickness requirement onsite clay soils gen for permeability, but requirements. Surfic meet USEPA requirement burg limits, while un P200, but, not Atterbu 3. Depth to groundwater ments, and in certai Groundwater discharge on and adjacent to dis apparently have flash the site is not in a f 4. The site is presentl accept PCB materials. lems with maneuverabil 5. Haul distance to the

PRELIMINARY SCREENING ASSESSMENT

'OWNING - FERRIS INDUSTRIES & CECOS - WILLIAMSB'

ASSESSMENT CRITERIA

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SITE ENGINEERING AND SITE OPERATIONS

The present method of landfilling at the existing BFI site is the cut and fill method and it is proposed to continue this method into the expansion site to the east. A leachate collection system does not exist at the existing site nor is one proposed for the new site, which does not meet USEPA requirements for PCB disposal. The base and sidewalls of the site are not presently recompacted after excavation of the soils, however, any permeable sand or silt layers encountered in the sidewalls or base grade are sealed off. The design concept of the site is to maintain a 10' barrier of natural clay soils or fill soils from the base grade and sidewalls to the more permeable layers, which is in accordance with IEPA requirements. Final covering at the site is to be a minimum of 3' of tightly compacted clay soil, topped with topsoil and vegetated with deep rooted grasses at a maximum slope not to exceed 5:1. The site also incorporates a 10' high core berm around the perimeter of the site, with the core constructed of clay.

Probable modifications of this site to facilitate PCB disposal include: 1. Use of the modified area fill method of disposal, 2. A simple leachate collection system, 3. Increase in base grade slope and the use of a granular blanket to facilitate leachate collection, 4. Surface water diversion to accommodate all the runoff from a 24 hour - 25 year storm must be maintained around the area of PCB disposal, and in addition, runoff would have to modified so that it could be contained and treated as leachate in the event that it became contaminated by PCB, 5. Recompaction of the clay soils on the sidewalls and base grades and the use of synthetic liners may be required to facilitate environmentally sound disposal of PCB, 6. Groundwater monitoring wells will have to be installed to monitor the specific PCB disposal area.

Based on an on-site visitation, the site has good daily operations, including compacting of the refuse, daily covering and policing of litter, however, the site apparently has a slight dust problem due to the clay roads in each module. Site operations will have to be modified to facilitate the disposal of PCB dredge materials per USEPA requirements, in addition to maintaining records on the concentration, quantity, and 3-D coordinate location, etc., associated with PCB waste disposal.

Other site facilities include a chain-link fence around its perimeter to control access per USEPA requirements, and adequate roadways to and within the site. The site appears to be operated in a safe manner.

SOCI

HAUL DISTANCES TO SITE, TRAFFIC PATTERNS & NEIGHBORHOOD CHARACTER

The landfill site is located about 12 r the Waukegan Harbor area by roadway distance potential routes are available from the Ha to the disposal site, however, the prefer would likely follow Highway 132 (Grand Ave 3 1/2 miles to north on Highway 131 for ab miles to 9th Street where it is only a shor north to the Highway 131 entrance of the land This route is preferred because it minimiz through residential areas north of the Wauke area, specifically Zion and Winthrop Harbor route utilizes the state highway system, wh facilitate rapid transit of the waste to the site. The location of the disposal site wit to the Waukegan Harbor area is a favorable

The landfill site and vicinity is classified as suburban residential. The la described as rolling farmland and timberlan useage within 1 mile of the site boundaries farmland, two other landfill sites to (American Admixtures and North Shore Sanitary residential subdivisions located approxim mile to the east (Winthrop Harbor) and sever residences located along 9th Street and Green Population is relatively sparse in the vicini landfill site.

The landfill site is apparently in an are well suited for the disposal of PCB with respe land useage on the adjacent parcels. The sp ulation in the vicinity of the landfill site favorable condition, provided that urban gr the City of Zion does not spread further

There are no identified archeological o ical sites, nor any reserved natural setting in the neighborhood of the disposal site.

The site is engineered with a multi-liner system, leachate withdrawal and monitor underdrain. The base of the landfill consists of 5' of recompacted clay overlain by an impermeable synthetic membrane liner which is overlain by 2' of uncompacted clay as a protective layer. The membrane liner is also placed over 5' of recompacted clay till on the side slopes and ties into another membrane liner which is placed over the waste as part of the final cover. Overlying the final cover membrane liner is 3' of clay material and 2' of final cover soil. Beneath the 5' clay liner is a 6" sand layer which ties into the monitor underdrain system. The underdrain system serves as a secondary leachate collection system. The primary leachate collection system which is installed on the base grades consists of a perforated 24" diameter concrete standpipe into which leachate may flow. Leachate levels are not monitored or pumped on a routine basis, however, leachate is pumped from the cells on a periodic basis to maintain levels 2' below original grade. Presently, the leachate is pumped into a holding basin until a sufficient quantity is collected for treatment. The leachate treatment consists of pumping the leachate onto the top of the daily cover in an adjacent secured landfill cell, into which a chemical agent is added to solidify the leachate. The solidified leachate is then placed back into one of the secured landfill cells.

The design concept for disposal at the site is to develop

Haul distance to the landfill site Waukegan Harbor area is about 350 miles; travel distance is not a favorable conditior posal at this site. The most likely route Harbor area to the landfill site would b south to Gary, Indiana, then southeast on Indianapolis, then southeast on I-74 to I-2 Cincinnati area. Local traffic from I-275 Road is adequate, however, Aber Road is a ve road.

The landfill site and vicinity is zoned tural, however, it is not suited for farming; is not expected to realize any signific growth. The primarily rural setting is char by sparse farm and non-farm residents and a population of about 2500 people.

Neighborhood characteristics include inc are somewhat below the county mean; low to income housing; unincorporated villages wit sanitary sewers and some dwellings without (1970 Statistics).

BROW

PHYSICAL-ENVIRONMENTAL CRITERIA

TOPOGRAPHY, SOILS AND BEDROCK

Topographic relief at the site is on the order of 30', ranging from about 755' MSL in the northern portion of the site to about 725' MSL in the southwestern corner; generally meets USEPA requirement of low to moderate relief.

Soil borings from the site indicate about 0.5' to 1' of dark, silty/clayey topsoil, underlain by about 5' of moderately plastic, silty clay (CL-CH), underlain by a brown to gray, low plasticity silty clay (CL) to a depth of at least 50' to 70' below ground surface (687' MSL). Interlayers up to 3' thick of silt (ML), clayey silt (ML-CL) and silty and clayey sand (SM-SC) occur in the clay soils. Apparently, a continuous layer of silt and sand extends east from the eastern border of the existing site under the adjacent 74 acre site, ranging from 2' to 15' in thickness, lying 40' to 60' below ground surface (690' to 718' MSL).

Constant head permeability tests on eight samples of the clay from depths ranging 20' to 42' below ground surface range from 1.9×10^{-6} to 1.1×10^{-8} cm/sec, averaging 4.3×10^{-7} cm/sec, while falling head permeability tests on eight samples from 20' to 32' below ground surface at the proposed site indicate the range of 1×10^{-7} to 6×10^{-9} cm/sec, averaging 2.4×10^{-8} cm/sec. Cation exchange capacities of the clays are low (~3 to 6 meq/100gms).

The soils generally meet the thickness requirement of USEPA (4') and Illinois EPA (10'). The soils generally meet the USEPA soil permeability requirement (1×10^{-7} cm/sec), however, marginally meet the Illinois EPA requirement (1×10^{-8} cm/sec). LL and PI were not measured as required by USEPA criteria. All samples tested of the silty clay exceed the USEPA 30% P200 requirement. ISGS indicates this area is suitable for disposal of all wastes except mobile, unattenuated, hazardous substances.

Dolomite bedrock is located about 200' below ground surface.

GROUNDWATER AND SURFACE WATER

Groundwater is reported to exist between 11' and 17' below ground surface at the existing site and 6 1/2' to greater than 12' below the proposed site. Groundwater flow direction was not reported, although flow direction is likely in a southerly direction. Depth to groundwater does not meet the USEPA requirement of at least 50' to the historical high water table below ground surface.

Judging from the topographic position of the landfill site, it may be in a local groundwater recharge zone, as it occupies a locally high topographic area and is surrounded by potential discharge points; Des Plaines River to the west, lowlands to the south, Lake Michigan to the east. According to USEPA requirements, a recharge zone should be avoided however, because of the thick sequence of clay at the site, recharge characteristics are probably minimal. Drinking water is obtained primarily from the dolomite bedrock aquifer. At least two private residences with deep wells are located along 9th Street at the southern boundary of the site; several other private residences are also located within 500' of the site boundaries along 9th Street, which also may have private well water supplies.

No natural streams, ponds or lakes occur on this site. Topographically, the site appears to lie near a surface water divide, such that surface water west of the site drains toward the Des Plaines River and east of the site toward the Lake Michigan basin. Surface drainage across the site is reported to be predominantly west and south. The site is not located within the 100 year floodplain, however, standing water has apparently occurred in the past near the northern portion of the site.

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Topographic relief at the site is about 35', with elevations ranging from about 879' MSL adjacent to Pleasant Run Creek (southwest) to about 913' MSL (northeast). Present and proposed disposal areas are located in a fairly flat area and meet USEPA requirements of low to moderate relief.

The general geology of the site is such that about 6' to 8' of a gray brown silty clay (CL) is underlain by about 40' of a gray brown sandy clay till (SC, SC-SM), which in turn, is underlain by interbedded shale and limestone. In the western portion of the site, discontinuous sand seams are present about 25' to 30' below grade, however, in the eastern portion of the site, a continuous sand seam on the order of 5 feet can be generally traced over a 20 acre area, where the new secured landfill cells are to be developed. The clay soils meet thickness requirements of USEPA (4') and OEPA (25').

Soil tests indicate that the silty clay and clay till soils generally have permeabilities less than 1×10^{-7} cm/sec, meeting requirements of USEPA and conditionally meeting those of OEPA. Average properties of

Depth to groundwater in the northern portion of the site is generally within 2' of ground surface, while it varies from about 2' to 20' in the southern portion and from 2' to 7' in the western area; this does not meet the USEPA requirements of 50' to historical high water table below the base of the site or OEPA requirement of 5' below ground surface in certain areas.

Groundwater flows generally in a southerly direction toward the East Branch and southwestward toward Pleasant Run Creek, which are local discharge points. Vertical hydraulic groundwater gradients are generally slightly upward, however, are seasonally downward during recharge events, based on water levels from nested wells at the western and northeastern portions of the site. In the northern portion of the site, vertical hydraulic gradients are steeply downward in the vicinity of two pumped wells, in response to the pumping. Apparently, there is little hydraulic connection between the groundwater flow systems in the soils and in the underlying bedrock, however, there appears to be good hydraulic connection within the bedrock formation.

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CECOS - WILLIAMSBURG

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The interbedded limestone and shale bedrock lies approximately 50' to 60' below ground surface. This rock formation yields little water, however, small quantities may percolate through fractures and in the weathered zone.

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icept for disposal at the site is to develop landfill cells under dry disposal conditions berms are used to separate incompatible waste er.

entire site is not fenced and access to the r site facilities is not controlled. However, fill site is fenced, which may meet USEPA

ite is a licensed facility, it is assumed that USEPA and OEPA regulations regarding the daily rd keeping associated with PCB disposal. Daily o include the visual inspection of individual into the disposal site. However, only minimal e performed on the wastes to determine their stics.

within the facilities is difficult for semi- arge trucks requiring access to the disposal are fairly small and when they are divided t areas by the use of berms, there is little ility for trucks to unload.

site. The location of the disposal site with respect to the Waukegan Harbor area is a favorable condition.

The landfill site and vicinity is presently classified as suburban residential. The land can be described as rolling farmland and timberlands. Land useage within 1 mile of the site boundaries includes farmland, two other landfill sites to the east, (American Admixtures and North Shore Sanitary District), residential subdivisions located approximately 1/2 mile to the east (Winthrop Harbor) and several private residences located along 9th Street and Green Bay Road. Population is relatively sparse in the vicinity of the landfill site.

The landfill site is apparently in an area that is well suited for the disposal of PCB with respect to the land useage on the adjacent parcels. The sparse population in the vicinity of the landfill site is also a favorable condition, provided that urban growth from the City of Zion does not spread further westward.

There are no identified archeological or historical sites, nor any reserved natural settings located in the neighborhood of the disposal site.

Haul distance to the landfill site from the Waukegan Harbor area is about 350 miles; this long travel distance is not a favorable condition for disposal at this site. The most likely route from the Harbor area to the landfill site would be: I-294, south to Gary, Indiana, then southeast on I-65 to Indianapolis, then southeast on I-74 to I-275 in the Cincinnati area. Local traffic from I-275 to Aber Road is adequate, however, Aber Road is a very narrow road.

The landfill site and vicinity is zoned agricultural, however, it is not suited for farming; the area is not expected to realize any significant urban growth. The primarily rural setting is characterized by sparse farm and non-farm residents and a township population of about 2500 people.

Neighborhood characteristics include incomes that are somewhat below the county mean; low to moderate income housing; unincorporated villages with no sanitary sewers and some dwellings without plumbing (1970 Statistics).

	are unacceptable. 5. Haul distance to the site from the Waukegan Harbor area is moderately far, but routing to the site is along good roads. This government facility is located in a sparcely populated area. 6. Acceptability of disposal of PCB dredge materials on site is not presently known; site is under federal jurisdiction.
The availability of the site for disposal of PCB contaminated dredge materials is not presently known; the site is under the jurisdiction of the US Army and the Federal Government. Ft. Sheridan is presently licensed to dispose miscellaneous refuse on about an 8 acre site located in the NW 1/4, Section 14 T43 R12	1. Most parts of the site have low to moderate topographic relief which meets USEPA requirements. 2. Onsite soils generally meet USEPA and IEPA soil thickness requirements. Soil permeability meets USEPA criteria and marginally meets IEPA requirements. Soils do not meet USEPA Atterburg limit requirements. 3. Depth to groundwater apparently does not meet USEPA requirements. ~~The site is not within a flood prone area~~ 4. Present site does not have a leachate collection system, which does not meet USEPA requirements; present site has problems and requires extensive modifications or relocation. 5. Haul distance to the site from the Waukegan Harbor area is relatively short. The site is located in a densely populated, urban, residential area. 6. Acceptability of disposal of PCB dredge materials onsite is not presently known; site is under federal jurisdiction.
The availability of the site for disposal of PCB contaminated dredge materials is presently not known. The facility is under the jurisdiction of the US Navy and Federal Government. Presently, the site has not submitted an application to IEPA to operate or develop a landfill site on the property.	1. Site generally has low to moderate topographic relief, which meets USEPA requirements. 2. Soils generally meet USPEA and IEPA soil thickness requirements, except where sand lenses occur at shallow depths. 3. Depth to groundwater meets USEPA requirements. 4. No information is available about present landfill site operations. It is likely the disposal site would have to be completely remodified or relocated for design per USEPA and IEPA requirements. 5. The haul distance to the site from the Waukegan Harbor area is very short. The route to the site and area in the vicinity of the site is heavily populated urban, residential area. 6. Acceptability of disposal of PCB dredge materials onsite is not presently known; site is under federal jurisdiction.

TABLE 2

GOVERNMENT OWNED FACILITIES

SITE SELECTION AND EVALUATION FOR

A HAZARDOUS WASTE DISPOSAL SITE

WARZYN ENGINEERING INC			
DRAWN JDP	SCALE —	SHEET 2	
CHECKED DRV	DATE 10-29-80	DRAWING NO. C 9400-	
APPROVED Donald W Hall			
REFERENCE			OCT 3

JOLIET ARMY A	crops in the western portion of the property and varies from 5' to 55' below ground surface in other parts of the site. The outwash soils in the western part of the site do not meet USEPA or IEPA soil thickness requirements of 4' and 10' of clay, respectively. The silty clay soils in the eastern part of the site apparently meet thickness requirements, however, no soil test data was available to compare USEPA requirements for permeability and Atterburg limit characteristics of the soils. In general, ISGS does not recommend disposal in the lowland areas based on presence of shallow bedrock aquifer; some upland areas suitable for all waste disposal except mobile, unattenuated hazardous waste. The present waste disposal site is located in an area of shallow bedrock, shallow water table and coarse grained soils.	the property west of the es standing water in some areas
FT. SHERIDAN ARMY BASE	Topography at the site is generally slightly undulating, however is cut by ravines roughly perpendicular to the shoreline of Lake Michigan; a 60' to 80' bluff is present at the shoreline. Upland elevations range from about 625' near the bluff tops to about 695' MSL at the western boundary of the site. The ravines typically have 25' to 50' of bank relief. Parts of the site meet the USEPA requirement of low to moderate relief. Well logs indicate that the general geology is such that about 180' to 215' of silty clay till interbedded with lenses of sand and gravel overlie Niagaran dolomite. Three borings in the northwest quarter of Section 14, at a land disposal site operated on the property since 1955, indicate silty clay soils (CL, CL-CH) interbedded with thin layers of silt to a depth of at least 58'. These soil conditions generally meet the USEPA and IEPA thickness requirements of 4' and 10', depending on the degree of interbedding of silt and sand layers. Results of permeability tests and two samples of the silty clay soils indicate values of 1×10^{-8} cm/sec. and 1.2×10^{-7} cm/sec., meeting the USEPA requirement of 1×10^{-7} cm/sec. and marginally meeting the IEPA requirements of 1×10^{-8} cm/sec. Results of Atterburg limit tests on seven silty clay soil samples indicates a range of LL, 22% to 32%, averaging 26%; PI,9% to 18%, averaging 13%; LL and PI do not meet USEPA requirements of 30% and 15%, respectively. Cation exchange capacities of the silty clay soils are generally low (~5 to 7) meq/100gms). ISGS indicates that soils are adequate for disposal of all wastes except mobile, unattenuated hazardous substances.	Depth to groundwater in wells at the site varies to about 41' near the top beach was near lake level. USEPA depth to groundwater high watertable. Direction of groundwat and perhaps, locally toward ents are likely downward, tions, however, due to the adjacent groundwater disc characteristics are likely n Surface water flow occ to surface water drainage tent, due to groundwater se year flood plain, nor are t
GREAT LAKES NAVAL BASE	Topographic relief in the upland portion of the site is generally less than 30', however, a large ravine perpendicular to the shoreline is present in the southern part of the site and has bank relief of about 20' to 60'. A 50' bluff occurs at the eastern margin of the site. The topography generally meets USEPA requirements of low to moderate relief. The general geology at the site is such that a sandy, gravelly, clay till interbedded with occasional sand and gravel lenses overlies dolomite bedrock. The thickness of the clay till varies from about 130' to 190'. Interbedding of coarse-grained soils was noted to be interspersed throughout the thickness of clay till, the most notable being a 4' sandy gravel lense within 15' of ground surface, however, most of these lenses were at depth. A gravel or crushed rock layer up to 20' thick typically overlies the bedrock surface. The soils apparently meet USEPA and IEPA soil thickness requirements of 4' and 10', respectively. The results of soil tests were not available to determine their suitabililty with respect to USEPA requirements for permeability and Atterburg limits. ISGS indicates that soils are suitable for disposal of all waste types except for mobile, unattenuated hazardous substances.	Depth to groundwater 50' to 100' below surface, table elevation is near la of 50' to historical high g The direction of hori Lake Michigan, and perhaps hydraulic gradients are l charge conditions. Howeve and depth to groundwater, minimal. A perennial stream fl Michigan. The area confin prone area of the 100-year site are flood-prone.

ured, faulted, jointed, cherty dolomite which out-
ern portion of the property and varies from 5' to
surface in other parts of the site.

soils in the western part of the site do not meet
il thickness requirements of 4' and 10' of clay,
ie silty clay soils in the eastern part of the
meet thickness requirements, however, no soil test
le to compare USEPA requirements for permeability
nit characteristics of the soils. In general, ISGS
id disposal in the lowland areas based on presence
k aquifer; some upland areas suitable for all waste
iobile, unattenuated hazardous waste. The present
te is located in an area of shallow bedrock, shal-
nd coarse grained soils.

and its tributaries are in flood-prone areas, furthermore, much of the property west of the escarpment is marshy lowlands, with free standing water in some areas.

it the site is generally slightly undulating, how-
avines roughly perpendicular to the shoreline of
60' to 80' bluff is present at the shoreline.
range from about 625' near the bluff tops to
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55, indicate silty clay soils (CL, CL-CH) inter-
layers of silt to a depth of at least 58'. These
generally meet the USEPA and IEPA thickness re-
and 10', depending on the degree of interbedding
layers.

permeability tests and two samples of the silty
ite values of 1×10^{-8} cm/sec. and 1.2×10^{-7}
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g the IEPA requirements of 1×10^{-8} cm/sec. Re-
g limit tests on seven silty clay soil samples
of LL, 22% to 32%, averaging 26%; PI,9% to 18%,
and PI do not meet USEPA requirements of 30% and
. Cation exchange capacities of the silty clay
ly low (~5 to 7) meq/100gms). ISGS indicates
equate for disposal of all wastes except mobile,
dous substances.

Depth to groundwater from unstabilized water level readings in wells at the site varies from about 5' near the western boundary to about 41' near the top of the bluff; groundwater level at the beach was near lake level. This site apparently does not meet USEPA depth to groundwater requirements of 50' below historical high watertable.

Direction of groundwater flow is east toward Lake Michigan, and perhaps, locally toward the ravines. Vertical hydraulic gradients are likely downward, indicating groundwater recharge conditions, however, due to the thickness of the silty clay soils and adjacent groundwater discharge zone (Lake Michigan), recharge characteristics are likely minimal.

Surface water flow occurs intermittently in the ravines due to surface water drainage into them, and perhaps, to a minor extent, due to groundwater seepage. The site is not within the 100-year flood plain, nor are there any flood-prone areas on the site.

relief in the upland portion of the site is
han 30', however, a large ravine perpendicular
is present in the southern part of the site
ief of about 20' to 60'. A 50' bluff occurs at
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rspersed throughout the thickness of clay till,
being a 4' sandy gravel lense within 15' of ground
most of these lenses were at depth. A gravel or
up to 20' thick typically overlies the bedrock

ly meet USEPA and IEPA soil thickness requirements
spectively. The results of soil tests were not
rmine their suitabililty with respect to USEPA
permeability and Atterburg limits. ISGS indicates
itable for disposal of all waste types except for
ed hazardous substances.

Depth to groundwater reported on boring logs vary from about 50' to 100' below surface, however, it can be assumed that water table elevation is near lake level; this meets USEPA requirements of 50' to historical high groundwater.

The direction of horizontal groundwater flow is east towards Lake Michigan, and perhaps, locally toward the ravine. Vertical hydraulic gradients are likely downward, indicating slight recharge conditions. However, due to the thick sequence of clays and depth to groundwater, recharge characteristics are likely minimal.

A perennial stream flows in the ravine and empties into Lake Michigan. The area confined to the ravine is within the flood-prone area of the 100-year flood, however, no other parts of the site are flood-prone.

to allow PCB disposal. Furthermore, it is assumed that the present site does not meet the USEPA requirements for site operations, and therefore, all operating and record keeping procedures would have to be designed and implemented to meet those requirements.

Presently, the facility is licensed for operating a land disposal site on the property. The design concept for the present landfill site is to fill a ravine which is perpendicular to the shoreline of Lake Michigan. The present site does not meet USEPA requirements for disposal of PCB because it does not have a leachate collection system. Engineering of an acceptable PCB disposal facility at the existing site is probably not feasible due to the extensive modifications required of the site, an unstable shoreline condition at the site, the presence of a storm sewer directly beneath the site, and storm routing and surface water diversion problems.

A PCB disposal facility on this property would have to be completely redesigned and operated to meet USEPA and IEPA requirements regarding PCB disposal, and probably relocated. A feasibility study would have to be performed for a relocated site to document proper soil and groundwater conditions. A suitable engineering design, plan of operation and record keeping procedures for PCB disposal would also need to be developed and implemented.

Ft. Sheridan is located approximately 12 miles south of the Waukegan Harbor area along Lake Michigan. Several routes south to the site are available along Sheridan Road, Green Bay Road and I-94, each road successively further westward from the Waukegan Harbor area. Both Sheridan and Green Bay Roads are in heavily urbanized areas and it is likely that traffic flow on Sheridan Road is interrupted frequently. In contrast, traffic flow along Green Bay Road is probably somewhat more rapid and could be accessed fairly easily from the harbor area along Sheridan Road, west on Washington Ave., southwest on Glen Rock Avenue and west on Belvidere Street to Green Bay Road. The most rapid flow would be along I-94, and it could be accessed utilizing the same route as for Green Bay Road. In all cases, the travel distance to the site is relatively short. In the vicinity of the site, all routes lead to Westleigh Road, which is routed directly by the Ft. Sheridan site.

The vicinity of the Ft. Sheridan site is a densely populated residential area; the housing reflects moderate to upper income families.

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Presently, no information is available on the site engineering or operations of the unlicensed disposal operations at this site. It is assumed that the present facility does not meet USEPA requirements for PCB disposal and that the site would have to be subjected to a complete investigation regarding the suitability of the site for PCB disposal. In general, a study to determine the soils and groundwater conditions would be required to determine the feasibility of the site and to facilitate the appropriate design, engineering and operation of a PCB disposal site.

The site is approximately 4 miles south of the Waukegan Harbor area. The site is easily accessed from the Waukegan Harbor area along Sheridan Road, through a predominantly densely populated low to middle income and industrialized route. Traffic flow along Sheridan Road is likely to be frequently interrupted, however, it is the most direct route to the site.

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BASE

IIA

ITY AND AVAILABILITY OF SITE
ERSHIP AND ORDINANCES

	SUMMARY
acceptability and availability of of the government-owned facility resently known. Local ordinances pply, as the site is under exclu-sdiction of the U.S. Army and overnment. In August, 1980, a plication filed with the Illinois a land disposal site in operation 5 was denied basically on the in-iess of the submittal. The permit on describes a parcel of land on property as 9.4 acres, located in 4, NE 1/4, Section 35, T34, R9.	1. Most of property has low to moderate topographic relief, which meets USEPA requirements. 2. Only soils in the upland (eastern 2/3) portion of site generally meet USEPA and IEPA soil thickness requirements. Bedrock depth is very shallow in western 1/3 of site; present disposal site is located in unacceptable area. 3. Depth to groundwater does not meet USEPA rquirements; very shallow groundwater in western portion of site. Four streams flow through and adjacent to the site; much of western 1/3 of site is in flood prone area. 4. Any site chosen on the JAAP site would likely have to be completely redesigned per USEPA and IEPA requirements to facilitate PCB disposal; present site design and operation are unacceptable. 5. Haul distance to the site from the Waukegan Harbor area is moderately far, but routing to the site is along good roads. This government facility is located in a sparcely populated area. 6. Acceptability of disposal of PCB dredge materials on site is not presently known; site is under federal jurisdiction.
availability of the site for dispo-CB contaminated dredge materials resently known; the site is under sdiction of the US Army and the government. Sheridan is presently licensed to iiscellaneous refuse on about an 8 located in the NW 1/4, Section R12	1. Most parts of the site have low to moderate topographic relief which meets USEPA requirements. 2. Onsite soils generally meet USEPA and IEPA soil thickness requirements. Soil permeability meets USEPA criteria and marginally meets IEPA requirements. Soils do not meet USEPA Atterburg limit requirements. 3. Depth to groundwater apparently does not meet USEPA requirements. ~~The site is not within a flood prone area.~~ 4. Present site does not have a leachate collection system, which does not meet USEPA requirements; present site has problems and requires extensive modifications or relocation. 5. Haul distance to the site from the Waukegan Harbor area is relatively short. The site is located in a densely populated, urban, residential area. 6. Acceptability of disposal of PCB dredge materials onsite is not presently known; site is under federal jurisdiction.
availability of the site for dis-PCB contaminated dredge materials tly not known. The facility is	1. Site generally has low to moderate topographic relief, which meets USEPA requirements. 2. Soils generally meet USEPA and IEPA soil thickness

T LAKES NAVAL BASE

CIOECONOMIC CRITERIA

SITE, & ACTER	ACCEPTABILITY AND AVAILABILITY OF SITE - OWNERSHIP AND ORDINANCES	SUMMARY
m the Waukegan Harbor rbor area to the dis- I-294, then southwest o the disposal site. facility and based on populated rural area	The acceptability and availability of the site of the government-owned facility is not presently known. Local ordinances do not apply, as the site is under exclusive jurisdiction of the U.S. Army and Federal Government. In August, 1980, a permit application filed with the Illinois EPA for a land disposal site in operation since 1955 was denied basically on the incompleteness of the submittal. The permit application describes a parcel of land on the JAAP property as 9.4 acres, located in the NE 1/4, NE 1/4, Section 35, T34, R9.	1. Most of property has low to moderate topo which meets USEPA requirements. 2. Only soils in the upland (eastern 2/3) generally meet USEPA and IEPA soil thickne Bedrock depth is very shallow in wester present disposal site is located in una 3. Depth to groundwater does not meet USE very shallow groundwater in western po Four streams flow through and adjacent to of western 1/3 of site is in flood prone 4. Any site chosen on the JAAP site would li completely redesigned per USEPA and IEPA facilitate PCB disposal; present site desi are unacceptable. 5. Haul distance to the site from the Wauke is moderately far, but routing to the sit roads. This government facility is locat populated area. 6. Acceptability of disposal of PCB dredge m is not presently known; site is under fe tion.
12 miles south of the everal routes south to reen Bay Road and I-94, m the Waukegan Harbor e in heavily urbanized heridan Road is inter- w along Green Bay Road accessed fairly easily st on Washington Ave., videre Street to Green I-94, and it could be reen Bay Road. In all atively short. In the stleigh Road, which is is a densely populated erate to upper income	The availability of the site for disposal of PCB contaminated dredge materials is not presently known; the site is under the jurisdiction of the US Army and the Federal Government. Ft. Sheridan is presently licensed to dispose miscellaneous refuse on about an 8 acre site located in the NW 1/4, Section 14, T43, R12.	1. Most parts of the site have low to moder relief which meets USEPA requirements. 2. Onsite soils generally meet USEPA and IEPA requirements. Soil permeability meets USE marginally meets IEPA requirements. Soil USEPA Atterburg limit requirements. 3. Depth to groundwater apparently does not quirements. The site is not within a fl 4. Present site does not have a leachate coll which does not meet USEPA requirements; p problems and requires extensive modifica cation. 5. Haul distance to the site from the Waukegan relatively short. The site is located populated, urban, residential area. 6. Acceptability of disposal of PCB dredge m is not presently known; site is under fe tion.
of the Waukegan Harbor Waukegan Harbor area densely populated low Traffic flow along	The availability of the site for disposal of PCB contaminated dredge materials is presently not known. The facility is under the jurisdiction of the US Navy and Federal Government. Presently, the site	1. Site generally has low to moderate topograp relief, which meets USEPA requirements. 2. Soils generally meet USPEA and IEPA requirements, except where sand lenses oc

PRELIMINARY SCREENING ASSESSMENT
JNITION PLANT , FT. SHERIDAN ARMY BASE & GREAT

ASSESSMENT CRITERIA

'AL CRITERIA		SOCIO
ACE WATER	SITE ENGINEERING AND SITE OPERATIONS	HAUL DISTANCES TO SITE TRAFFIC PATTERNS & NEIGHBORHOOD CHARACT
2' to 36' below ground ie USEPA requirement of rection of groundwater Plaines and Kankakee nts. The shallow dolo- of well water supply. er portions of the bed- le water, however, the potential for ground- ks, which all generally 's and Kankakee Rivers; ie site, Grant Creek at the central portion of ern boundary. Much of creek and Jackson Creek s; furthermore, much of hy lowlands, with free	Little is known about the site engineering and operations at the JAAP facility due to the incompleteness of their disposal permit application filed with the IEPA and no on-site visitation. However, it is assumed that the present site on the JAAP property is not suitable for PCB disposal and that the present site would have to be completely remodified or relocated on the property to facilitate PCB disposal, per USEPA and IEPA requirements. To meet the proper design and engineering requirements, the site would need a feasibility study performed to document soils, groundwater and bedrock conditions. An engineering design would have to be performed to modify the site to allow PCB disposal. Furthermore, it is assumed that the present site does not meet the USEPA requirements for site operations, and therefore, all operating and record keeping procedures would have to be designed and implemented to meet those requirements.	The JAAP property is about 75 miles from the area. A preferred route from the Waukegan Harbor posal site would likely be: I-94 south to I-294 on I-55 to STH 53, then south on STH 53 to the The JAAP property is a government owned facil topographic maps, is located in a sparsley popul south of Joliet, Illinois.
water level readings r the western boundary oundwater level at the rently does not meet 50' below historical toward Lake Michigan, tical hydraulic gradi- water recharge condi- silty clay soils and Michigan), recharge y in the ravines due haps, to a minor ex- s not within the 100- ne areas on the site.	Presently, the facility is licensed for operating a land disposal site on the property. The design concept for the present landfill site is to fill a ravine which is perpendicular to the shoreline of Lake Michigan. The present site does not meet USEPA requirements for disposal of PCB because it does not have a leachate collection system. Engineering of an acceptable PCB disposal facility at the existing site is probably not feasible due to the extensive modifications required of the site, an unstable shoreline condition at the site, the presence of a storm sewer directly beneath the site, and storm routing and surface water diversion problems. A PCB disposal facility on this property would have to be completely redesigned and operated to meet USEPA and IEPA requirements regarding PCB disposal, and probably relocated. A feasibility study would have to be performed for a relocated site to document proper soil and groundwater conditions. A suitable engineering design, plan of operation and record keeping procedures for PCB disposal would also need to be developed and implemented.	Ft. Sheridan is located approximately 12 mil Waukegan Harbor area along Lake Michigan. Several the site are available along Sheridan Road, Green Ba each road successively further westward from the area. Both Sheridan and Green Bay Roads are in h areas and it is likely that traffic flow on Sherida rupted frequently. In contrast, traffic flow alon is probably somewhat more rapid and could be access from the harbor area along Sheridan Road, west on southwest on Glen Rock Avenue and west on Belvidere Bay Road. The most rapid flow would be along I-94, accessed utilizing the same route as for Green Ba cases, the travel distance to the site is relativel vicinity of the site, all routes lead to Westleigh routed directly by the Ft. Sheridan site. The vicinity of the Ft. Sheridan site is a d residential area; the housing reflects moderate families.
logs vary from about be assumed that water ts USEPA requirements	Presently, no information is available on the site engineering or operations of the unlicensed disposal operations at this site. It is assumed that the present facility does not meet USEPA requirements	The site is approximately 4 miles south of the area. The site is easily accessed from the Waukeg along Sheridan Road, through a predominantly densel to middle income and industrialized route. Traf Sheridan Road is likely to be frequently interrupt

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PHYSICAL-ENVIRONMENTA

TOPOGRAPHY, SOILS AND BEDROCK

Topographic relief over the 36 sq.mi. area is about 125', ranging in elevation from about 525' MSL near the western edge of the property to about 650' MSL at the eastern boundary. The area can be characterized as a lowland with swamps, ridges and gently rolling topography. A 40' to 50' north-south trending escarpment is located in the western third of the property. West of the escarpment, elevations range from about 525' to 575' MSL; east of the escarpment, 625' to 650' MSL. Much of the property has low to moderate relief, particularly in the eastern portion of the site, therefore, meets USEPA requirments. The area is drained by four major creeks, which drain to the Des Plaines and Kankakee Rivers to the west of the site.

The general geology of the property is such that the eastern two-thirds is a morainic upland consisting of about 22' to 55' of silty clay till, while the western one-third consists of about 5' to 23' of silty sand outwash. Underlying the soils is the Niagaran Dolomite, a fractured, faulted, jointed, cherty dolomite which outcrops in the western portion of the property and varies from 5' to 55' below ground surface in other parts of the site.

The outwash soils in the western part of the site do not meet USEPA or IEPA soil thickness requirements of 4' and 10' of clay, respectively. The silty clay soils in the eastern part of the site apparently meet thickness requirements, however, no soil test data was available to compare USEPA requirements for permeability and Atterburg limit characteristics of the soils. In general, ISGS does not recommend disposal in the lowland areas based on presence of shallow bedrock aquifer; some upland areas suitable for all waste disposal except mobile, unattenuated hazardous waste. The present waste disposal site is located in an area of shallow bedrock, shallow water table and coarse grained soils.

GROUNDWATER AND SURFAC

Depth to groundwater varies from about 2' surface at the site, which does not meet the 50' to historical high watertable. The dire flow is west to southwest toward the Des P Rivers, which are groundwater discharge points mite bedrock is locally used as a source of The fractured and jointed nature of the upper rock make it suitable as a supply of potable permeable nature of the rock increases the p water contamination of the aquifer by wastes.

The property is drained by 4 major creeks, flow from east to west toward the Des Plaines Jackson Creek at the northern boundary of the the western boundary, Prairie Creek through th the site, and Jordan Creek at the southeaster the area adjacent to Prairie Creek, Jordan Cre and its tributaries are in flood-prone areas; the property west of the escarpment is marshy *standing water in some areas.*

Topography at the site is generally slightly undulating, however is cut by ravines roughly perpendicular to the shoreline of Lake Michigan; a 60' to 80' bluff is present at the shoreline. Upland elevations range from about 625' near the bluff tops to about 695' MSL at the western boundary of the site. The ravines typically have 25' to 50' of bank relief. Parts of the site meet *the USEPA requirement of low to moderate relief.*

Well logs indicate that the general geology is such that about 180' to 215' of silty clay till interbedded with lenses of sand and gravel overlie Niagaran dolomite. Three borings in the northwest quarter of Section 14, at a land disposal site operated on the property since 1955, indicate silty clay soils (CL, CL-CH) interbedded with thin layers of silt to a depth of at least 58'. These soil conditions generally meet the USEPA and IEPA thickness requirements of 4' and 10', depending on the degree of interbedding of silt and sand layers.

Results of permeability tests and two samples of the silty clay soils *indicate values of* 1×10^{-8} cm/sec. *and* 1.2×10^{-7} cm/sec., meeting the USEPA requirement of 1×10^{-7} cm/sec. and marginally meeting the IEPA requirements of 1×10^{-8} cm/sec. Results of Atterburg limit tests on seven silty clay soil samples indicates a range of LL, 22% to 32%, averaging 26%; PI,9% to 18%, averaging 13%; LL and PI do not meet USEPA requirements of 30% and 15%, respectively. Cation exchange capacities of the silty clay soils are generally low (~5 to 7) meq/100gms). ISGS indicates that soils are adequate for disposal of all wastes except mobile, unattenuated hazardous substances.

Depth to groundwater from unstabilized in wells at the site varies from about 5' near to about 41' near the top of the bluff; grou beach was near lake level. This site appar USEPA depth to groundwater requirements of high watertable.

Direction of groundwater flow is east t and perhaps, locally toward the ravines. Vert ents are likely downward, indicating groundw tions, however, due to the thickness of the adjacent groundwater discharge zone (Lake characteristics are likely minimal.

Surface water flow occurs intermittently to surface water drainage into them, and pert tent, due to groundwater seepage. The site is year flood plain, nor are there any flood-pron

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Topographic relief in the upland portion of the site is generally less than 30', however, a large ravine perpendicular to the shoreline is present in the southern part of the site and has bank relief of about 20' to 60'. A 50' bluff occurs at

Depth to groundwater reported on boring 50' to 100' below surface, however, it can b table elevation is near lake level; this mee of 50' to historical high groundwater.

2. Since the OMC site would be considered a new facility, it would have to go through the permitting processes with both State and Federal Agencies. This would create delays in implementing these options.

3. Any of the several options for OMC property would preclude the necessity of transporting the contaminated PCB material over the roadway to an off-site disposal facility.

4. IEPA has indicated that they do not favor permanent land disposal of PCB contaminated materials at the OMC site. They will more favorably consider temporary storage for ultimate removal. The decision whether PCB disposal will be allowed at the OMC site on a permanent basis is an issue that will have to be reached at the State-Federal level. In addition, public reaction to on-site alternatives is unpredictable.

5. All the on-site options will require additional hydrogeologic investigation to better define soil and groundwater conditions to assess the suitability of potential on-site alternatives. Until this work is done, it is difficult to speculate on what additional engineering details might be needed for development of any of the on-site options.

6. For any on-site disposal option, a clay borrow search should be conducted to identify potential sources of clay liner and capping materials.

Items 1 and 2 above point to potential delays in the permitting process, especially if it involves breaking new ground concerning the abatement alternatives and how the landfilling rules might apply to abatement (as opposed to disposal). Items 3 and 4 pose the respective best and worst conditions for on-site disposal. IEPA could cause considerable problems in implementing permanent on-site alternatives if they choose to. In contrast, any on-site alternative is cost effective, compared to off-site disposal.

2. Environmental Characteristics

a. Regional Setting

The OMC property is located in portions of the SW 1/4 and SE 1/4, Section 15 and the NW 1/4, Section 22, T45N, R23E, Lake County, Illinois. This site is bounded on the East by Lake Michigan, on the south by Waukegan Harbor on the west by the Chicago and Northwestern Railroad tracks and on the north by the North Shore Sanitary District Property.

The topography in the vicinity of the OMC property varies from flat to gently rolling. Elevations range from about 660 feet MSL two miles west of the OMC property to about 580 feet MSL at the edge of Lake Michigan.

Geologically, the low terrace level around Lake Michigan consists of recent shore deposits consisting of a variety of beach and beach related (dune and near shore marsh) deposits. Underlying the beach deposits at the site and to the west where the beach deposits thin out, lies a clayey silt glacial till. The thickness of this till unit is estimated at about 150 feet and includes a basal sand and gravel layer that overlies bedrock. Bedrock in the vicinity of this site is Silurian dolomite.

Groundwater is generally expected to occur within 5 to 35 feet of ground surface, and generally flows east toward Lake Michigan, or more locally, toward the Waukegan River. The Waukegan River drains into Lake Michigan approximately one mile south of the OMC property.

b. Site Hydrogeology

Topographically the site is located in a flat area adjacent to Lake Michigan. Elevations on the property range from about 582 feet MSL on the shore of Lake Michigan to about 586 feet MSL at the western margin of the property. This low relief meets USEPA requirements for PCB waste disposal.

The general geology of the area is such that 0 to 8 feet of sandy fill material (gray brown, fine to coarse, trace to little gravel, trace to little silt and clay; SP, SM, SP-SM, SP-SW) overlies sand (gray to gray brown, fine to coarse, trace to some gravel, trace to little silt and clay; SP, SP-SM, SM) to a depth of about 28 to 30 feet below ground surface. The sand layer, in turn, is underlain by a silt (gray to gray brown, some clay, trace sand, trace gravel; ML, ML-CL), which apparently is a glacial till deposit. This silty till deposit is underlain by dolomite bedrock about 150 feet below ground surface. The surficial sandy soils do not meet the USEPA and IEPA soil requirements for the development of PCB waste disposal. Therefore, a suitable liner would have to be constructed on-site to facilitate the disposal of PCB contaminated sediments at this site.

Soil tests indicate that the sandy soils have permeabilities ranging from about 8×10^{-4} to at least 8×10^{-3} cm/sec, based on infield baildown permeability tests performed on monitoring wells screened in the sandy soils. These sandy soils typically have less than 12% P200 content. The underlying silty layer has a permeability of about 1×10^{-7} cm/sec, based on one laboratory tested sample. LL and PI are typically less than 21% and 5%, respectively, while P200 content is typically 95% to 100%.

Depth to groundwater at the site is typically less than 5 feet below ground surface. This does not meet USEPA requirements of 50 feet to historical highwater table below the base of the site. Groundwater flow on the site varies from north (toward the north drainage ditch) to east toward Lake Michigan, which are both groundwater discharge points for the shallow groundwater system in the surficial sands. Groundwater is recharged

into this shallow groundwater system directly through the permeable sands on the property. Typically, the vertical hydraulic gradients near the north ditch are upward, indicating groundwater discharge conditions there. However, when the water level in the ditch is sufficiently high, such as caused by the backing up of water in the ditch by an on shore wind, groundwater recharge conditions may occur in the upper portions of the groundwater system. This site may not meet USEPA requirements as it lies in a zone of groundwater recharge and because of its proximity to the Lake Michigan shoreline.

Surface water bodies on-site include the north ditch and associated lagoons at the western end of the ditch system. These lagoons and the north ditch are a major source of PCB contamination at the site. The north ditch is hydraulically connected to Lake Michigan.

c. Socio-Economic Profile for the OMC Site

The following section will briefly discuss disposal of the PCB waste at the OMC site and the relationship of selected social political criteria to that option.

Land use surrounding the OMC site is predominantly industrial. Lake Michigan borders the site on the east, with the Chicago, Northwestern Railway Lines forming the western border of the site. Approximately 1/2 mile west of the site, the urbanized area of the City of Waukegan begins.

There is no residential population in the immediate site vicinity due to its industrial nature. The City of Waukegan urbanized area is densely populated and is isolated from the site via the Chicago and Northwestern Railroad line and Sheridan Avenue.

Transportation routes from the site radiate in a north, west and south direction. No transportation routes exist to the east because of the presence of Lake Michigan. The OMC site has ready access from the Waukegan Harbor area along Seahorse Drive, which terminates at the gatehouse of the OMC property closest to Lake Michigan.

Employment opportunities may be increased due to the OMC PCB clean-up. This increase would be temporary and involve only those workers specifically involved in the clean-up procedures. It is not expected that any existing employees would lose their jobs in relationship to the on-site PCB disposal. Disposal of the PCB wastes would not generate additional revenue and should not change the tax rate of the site. On-site disposal would not create a burden on existing public facilities such as schools, hospitals, police protection, fire protection, etc. However, on-site disposal would disturb much of the parking area at the OMC property to ranging degrees, depending on which disposal option was implemented, if any.

It is not expected that surrounding land use change would occur as a result of on-site disposal. The existing site use would remain industrial and the residential area to the west would remain unchanged.

It is not presently known whether OMC management would welcome the development of permanent waste disposal areas on their property, however, it may be economically attractive, depending on the extent of their financial liability (we will show that on-site alternatives are considerably less costly that off-site disposal). However, Illinois EPA has indicated that they believe that long-term disposal of PCB waste at the OMC property is not a favorable condition.

3. Option 3 - Total On-Site Excavation and Disposal in Parking Lot

a. Introduction

This option consists of disposing of all the PCB contaminated aterials in the parking lot area north of the OMC buildings, as presented n Drawing C 9400-8. Material from both the harbor area, and the north itch and parking areas would be disposed of in this facility. The material rom the harbor area would first be dewatered in temporary lagoons located n the old coke plant site.

b. Engineering Features

The facility would occupy the majority of the parking area esently located north of the OMC buildings with dimensions of 1700 feet ng and 330 feet wide. This facility would be constructed so it is in mpliance or commensurate with existing Illinois EPA and USEPA requirements r PCB disposal.

To facilitate construction of this facility, a slurry cut-off l would be constructed around the perimeter of the facility to allow watering of the disposal site. This slurry cut-off wall system would be ed into the underlying silt layer at approximately 30 feet below the rf This area could then be dewatered internally, which would permit e construction of the facility utilizing standard construction procedures. e water removed from this area must be treated since it may be contami- ed with PCB. The contaminated soils excavated during the construction the site (slurry cutoff and excavation of base grades) may have to be porarily stockpiled, (in temporary storage lagoons, if built first), le an initial phase or module of the disposal area could be readied for . Otherwise, the material could be delivered to a site licensed for

PCB disposal, but this could raise the costs of this option significantly. As newly contaminated material is excavated, it can be transferred to the completed portion of the fill area. Those sediments excavated which are not contaminated with PCB could be taken away and dumped as fill. Slurry cut-off walls utilized in this and other options for the OMC site would be approximately 2 1/2 feet in width and would be tied into the underlying silt layer, approximately 25 to 30 feet below the surface. The width of the cutoff is controlled by the type of equipment and can usually be varied within 1 1/2 feet to 3 feet. The slurry wall trenches would be backfilled with an impermeable bentonite/clay mixture. Bentonite slurry walls typically exhibit permeabilities in the range of 10^{-7} to 10^{-8} cm/sec. Existing utilities or abandoned utilities throughout this proposed disposal area would be relocated or removed.

Base grades of the facility would be approximately 30 feet below existing ground. Below grade, the liner and leachate collection systems would be installed (see Drawing C 9400-8). This liner system consists of a 6 inch granular blanket covered with a filter cloth to minimize infiltration of fine grained particles into the granular blanket. Below the granular blanket a 5 foot recompacted clay liner would be placed. All clay for this liner system would have to be imported to the site and would be recompacted to meet 10^{-8} cm/sec permeability requirements. A leachate collection line would be installed in the 5 foot clay liner, which would lead to manholes for leachate removal. An impermeable membrane liner would be installed in the lower portion of the 5 foot recompacted clay liner, which would be successively underlain by a 12 inch granular blanket which leads to the underdrain system, a 2 foot recompacted clay liner, and the existing

silt material, which has a permeability of approximately 10^{-7} cm/sec. The underdrain system would lead to manholes for leachate removal. The layouts of the leachate collection system and underdrain system are shown on Drawing C 9400-8.

Base grades would slope toward the leachate collection system at a minimum of 1%. The sidewalls would be constructed of 10 feet of recompacted clay with an impermeable membrane liner installed in the clay. Sideslopes at the facility would be at a 3H:1V slope.

Though the facility would be constructed below the existing groundwater level, groundwater infiltration through the slurry cut-off wall and liner system into the the wastes would be minimal. By maintaining an inward gradient, the potential for contaminant migration is lessened. The facility would be maintained as a dry system with any leachate removed from the site and disposed of at a treatment plant facility either on-site or off-site.

Groundwater monitoring wells would be installed around the facility to ascertain background water quality and monitor liner effectiveness. As indicated earlier, a minimum of three wells is required by USEPA. However, more wells should probably be installed to adequately monitor the facility.

The final cover of the facility would permit the return of the area to parking use. The final cover would consist of 12 inches of clay, an impermeable clay membrane liner, and an additional 2 feet of clay. The clay would be covered with gravel bituminous pavement. This final cover design is conceptual and a proper final design should consider the best method to minimize potential cracking of the bituminous and underlying clay cover soils. The bituminous pavement would minimize maintenance to

the final surface by limiting soil erosion and vegetation maintenance. By utilizing this final cover, water infiltration should be limited to the practical minimum. The impermeable membrane liner in the final cover would be tied to the impermeable membrane liner along the sides and on the base of the facility.

c. Summary of Costs

The following cost summary has been divided into several categories. Those categories are site preparation costs, operation and maintenance costs, site closure costs and long-term care costs. A detailed breakdown of this cost analysis is included in Appendix C for reference.

(1) Site Preparation Costs

Site preparation costs are incurred in developing the facility for acceptance of PCB contaminated wastes. Factors included are the following: excavation; slurry cut-off wall construction; clay liner construction; placement of granular blankets, filter cloth and impermeable membrane liner; recompaction of existing silts; leachate collection and underdrain system installation; disposal of excavated materials; relocation of utilities; and miscellaneous work. The site preparation cost for this option is estimated to be $5,852,000. This does not include any funding to restore areas that were excavated to remove PCB materials to their original grade.

(2) Operational Costs

Operational costs are incurred during the disposal of the PCB contaminated material. Work elements include the following: personnel, equipment, record keeping, water quality monitoring, and leachate collection and treatment. The cost for this work is estimated to be $350,000, assuming that the work is completed in one year.

(3) Site Closure Costs

Site closure costs are those costs occurred in abandoning the facility after the completion of the disposal of the PCB contaminated materials. Cost factors included are clay cover placement, impermeable membrane liner installation, gas venting installation, subbase and bituminous pavement construction, and miscellaneous work. The costs for abandoning this facility is estimated to be $1,463,000.

(4) Long-Term Care Costs

Long-term care costs are the costs incurred to maintain and inspect the facility after it has been abandoned. These costs include the following work elements; site inspections, final grade maintenance, water quality and gas monitoring, leachate collection and treatment, and record-keeping. These costs total about $112,000.

(5) Cost Summary

The following table summarizes the costs for this option.

TABLE 6
COST SUMMARY - OPTION 3

Site Preparation	$5,852,000
Operation	$ 350,000
Site Closure	$1,463,000
Long-Term Care	$ 112,000
Total	$7,777,000

d. Summary - Option 3

This option is the construction of a secured landfill in the parking area on the northern edge of the OMC property. The option would utilize the construction of a recompacted clay liner. A leachate collection

system and back-up underdrain system would be installed. The facility would be surrounded by a bentonite slurry cut-off wall keyed into the underlying silt layer for added security and allow dewatering of the disposal facility. This option requires long-term maintenance on the part of OMC or EPA, which includes leachate collection and treatment.

The favorable aspects of this on-site disposal option include:

1. Minimal handling of the PCB materials, compared to off-site disposal options, which significantly minimize costs.

2. Encapsulization of the wastes in an area that already is affected by PCB contamination.

3. Adequate environmental protection with leachate collection clay liners, slurry cutoff wall, etc.

Unfavorable aspects of this option include:

1. Maximum on-site handling of PCB materials compared to other on-site options.

2. Extensive dewatering during construction.

3. IEPA's unfavorable opinion of any permanent on-site disposal option.

4. Potential stockpiling of PCB contaminated materials until a module of the disposal area is ready for use, or disposal at a licensed site.

5. Disruption of OMC's parking facility for a considerable length of time.

This facility has limited documentation of existing hydrogeology and would require feasibility studies before detailed engineering plans could be completed. This may create delays in the timetable for actual disposal of material. In addition, approval would be needed from OMC to utilize their parking area and to close it for the duration of the disposal project.

4. Option 4 - Parking Area Disposal and Slurry Cutoff Wall around Crescent-Shaped Ditch and Oval Lagoon

a. Introduction

This option utilizes a combination of slurry cutoff wall containment and secured landfill disposal. The materials in the crescent-shaped ditch and the oval lagoon would remain in place with a slurry cutoff wall constructed around the perimeter of the areas. The other PCB contaminated materials from the north ditch area and the dredge materials from the harbor would be placed in the parking area, as discussed in Option 3.

Based on preliminary information on the location, concentration, and depth of PCB contamination, it appears that the areas of deepest PCB con ination are the crescent-shaped ditch and oval lagoon. Therefore, his system was designed to allow those contaminated sediments to remain n place while removing the more shallow contaminated materials in the itch area.

b. Engineering Features

The disposal facility located in the parking area would be constructed s indicated in Option 3. For reference, details of the liner and final over are included on Drawing C 9400-9. In general, the liner consists of o layers of recompacted clay along with an impermeable membrane liner. ere is a primary leachate collection system and a leachate collection derdrain system. The final cover consists of 3 feet of clay, an impermeable mbrane liner, and bituminous pavement to reduce the area back to parking e. Drawing C9400-9 also indicates the layout of the leachate collection d the underdrain systems. The parking area disposal facility would quire collection and treatment of the leachate to maintain a dry base te. Bentonite slurry cutoff walls would be installed around the perimeter the disposal facility to permit construction by standard techniques.

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Any utilities that exist in the construction area, including those that are in the vicinity of the crescent-shaped ditch, oval lagoon and parking lot disposal facility area, must be relocated. The materials from the dredged harbor area would be dewatered in lagoons at the old coke plant site, similar as proposed in Option 3. Similarly, contaminated materials collected during excavation of the parking lot disposal area and the proposed slurry cutoff trenches could be temporarily stored in the temporary storage lagoons, provided they are built first.

A slurry cutoff wall would be constructed around the crescent-shaped ditch and the oval lagoon. This slurry cutoff wall would be approximately 2 1/2 feet wide and constructed to a depth of about 25 to 30 feet to key into the existing silt layer underlying the site. Bentonite slurry walls typically exhibit permeabilities in the range of 10^{-7} to 10^{-8} cm/sec. As the slurry cutoff wall trench is excavated with a backhoe a bentonite slurry is added to form the trench and a seal on the inside and outside of the trench. The seal stops the flow of water into the area and, conversely, stops the migration of contaminants out of the area. A bentonite/clay mixture is then placed into the trench to bring the trench to original grade. The slurry cutoff wall construction technique is commonly used in construction to provide an impermeable barrier to groundwater flow so areas can be dewatered.

A leachate collection system would be installed in this area to maintain an inward gradient, however, only those soils needing removal to facilitate the installation of the collection system would be excavated from the area, which would subsequently be temporarily stockpiled until a permanent disposal area was ready. The leachate collection system would

be installed approximately four feet below existing groundwater and a leachate maintenance level would be established at approximately 2 to 4 feet below groundwater to maintain inward gradients.

An important element of this system is the in-place permeability of the underlying silt, which will require documentation. Based on information to date, it appears that the underlying silt is about 150 feet thick and exhibits a permeability of 10^{-7} cm/sec.

An extensive groundwater monitoring system would be installed to monitor the effectiveness of the engineering modifications on the basis of water quality.

c. Summary of Costs

The following cost summary has been divided into several categories. Those categories are: site preparation costs, operation and maintenance costs, site closure costs, and long-term costs. A detailed breakdown of this cost analysis is included in Appendix D.

(1) Site Preparation Costs

Site preparation costs are costs incurred in development of a disposal facility. The following work elements are included in site preparation costs for this option: excavation; placement of clay liner, filter cloth, granular material, and impermeable membrane; installation of leachate collection and underdrain systems; placement of slurry trench for dewatering; placement of slurry trench for containment; disposal of excavated materials; relocation of utilities, and miscellaneous work. The site preparation costs for this option are $5,973,000.

(2) Operation and Maintenance Costs

Operation and maintenance costs are the costs incurred in the day to day operation of the facility. Such costs include personnel, equipment, record keeping, water quality monitoring, and leachate collection and treatment. The cost for this option is about $350,000 per year. This is assuming that disposal of the wastes will be completed in one year.

(3) Site Closure Costs

Site closure costs are the costs to abandon the disposal facility and to place a cap over the in-situ containment facility to protect the underlying contaminated materials and to minimize surface water infiltration. The following work elements are included in the site closure costs for this option: placement of final cover and impermeable membrane liner; installation of bituminous pavement including base course; seeding, fertilizing and mulching; installation of gas vents; and miscellaneous work. The site closure costs for this option is $1,544,000.

(4) Long-Term Care Costs

Long-term care includes the annual inspections and maintenance work necessary after the site has been abandoned to maintain its integrity and its function. Such costs include site inspections, site grading, seeding to replace eroded areas, leachate collection and treatment, water quality and gas monitoring and record keeping. The costs for long-term care is approximately $112,000.

(5) Cost Summary

The following table summarizes the cost for Option 4 of handling the PCB contaminated disposal of waste at this location.

TABLE 7
Cost Summary - Option 4

WORK ELEMENT		COST
Site Preparation		$5,973,000
Operational Costs		350,000
Site Closure		1,544,000
Long-Term Care		112,000
	TOTAL COSTS	$7,979,000

d. Summary - Option 4

The favorable aspects of this option are generally similar to those of Option 3 (with the exception of the amount of contaminated materials handled on-site), and further, its' cost is comparable to Option 3's. Similarly, the drawbacks associated with Option 3 also generally apply to Option 4, however, an additional circumstance can be identified. In the area of the crescentshaped ditch and oval lagoon, there is risk involved with the the long-term reliability of the slurry cutoff. Failure of the wall could result in excess leachate handling from the area, and perhaps, further groundwater contamination from leachate leaving the contained area. The performance of the system could be monitored by a thorough groundwater monitoring program.

As with all on-site options, subsurface investigations would be required to evaluate the hydrogeologic conditions and its' suitability with respect to the use of this option.

5. Option 5 - Coke Plant Storage Lagoon, Parking Area Disposal and Slurry Cutoff Wall Abatement

a. Introduction

This option utilizes three different disposal areas to handle the PCB contamination problem. This option also presents two methods to handle the wastes in the crescent-shaped ditch and the oval lagoon areas. In Option 5A, the materials in the crescent-shaped ditch and oval lagoon would be surrounded by a slurry cutoff wall and left in place. In Option 5B, the materials in the crescent-shaped ditch and oval lagoon would be placed in the parking lot disposal facility. The remaining materials in the north ditch area would be placed in a disposal facility located in the parking lot. The materials from the harbor dredgings would be placed in lagoons located on the coke plant site. These lagoons would be constructed to permit long-term disposal rather than temporary storage. These disposal options are presented on Drawings C 9400-10 and 11.

b. Engineering Features

(1) North Ditch Area

For Option 5A, the slurry cutoff wall system around the crescent-shaped ditch and oval lagoon would be the same as utilized and discussed in Option 4. Any utilities traversing that area would be removed and rerouted.

For Option 5A, the other contaminated materials located in this north ditch area would be excavated and disposed of in the disposal facility indicated on Drawing C 9400-10. Uncontaminated soils excavated from this area would be used in the construction of the storage lagoons at the coke plant site. This facility would be approximately 880 feet long and 330 feet wide. The depth and width of the disposal area may be modified depending

upon the actual depth of the underlying silty layer. If the silt layer is within 25 feet of the surface and exhibits an adequate permeability (10^{-7} to 10^{-8} cm/sec), the liner system could probably be tied into the silt layer as has been proposed in Options 3 and 4. However, if the silt layer is at a depth greater than approximately 35 feet, then additional clay materials would be imported to the site for use as liner rather than tying the liner into the existing silt layer. For the economic analysis, it was assumed that clay would be imported.

The liner system for the north ditch area in Option 5A would consist of two 5 foot recompacted clay layers. On top of the first 5 foot recompacted layer would be a six inch granular blanket which would be covered by a filter cloth, while an impermeable membrane liner would be installed at the base. Underlying the first 5 foot clay liner would be a 12 inch granular blanket, which would lead to the underdrain system, underlain by a second 5 foot recompacted clay liner. The final cover to be utilized for Option 5A would be the same as that utilized for Option 4.

For Option 5B, the crescent-shaped ditch and oval lagoon contaminated materials, as well as the other contaminated materials in the north ditch, would be diposed of in the parking lot disposal facility indicated on Drawing C 9400-11. This facility would be approximately 806 feet long and 330 feet wide. The liner system utilized for Option 5B would be the same as utilized in Options 3 and 4. The detail of the liner is also shown on Drawing C 9400-11.

Both options in the parking lot disposal area would contain leachate collection and underdrain systems, as indicated in previous options. The base grades would slope at 1% toward the leachate collection system.

The slurry cutoff wall system would be utilized around the disposal facility in the parking lot to dewater the area to permit construction by standard techniques. Any utilities located in these areas would have to be relocated as in past options. The parking area would be returned to parking use after its abandonment.

(2) Harbor Material

The permanent storage lagoons for the harbor dredgings (Options 5A or 5B) lagoons would be constructed at the location where the temporary dewatering lagoons were constructed for other options. These lagoons would serve as dewatering lagoons as well as the final disposal location for the material from the harbor. The layout of the lagoons and associated details of the lagoons are shown on Drawings C 9400-10 and 11. The lagoons would be constructed above ground since the coke plant site has numerous foundations underground and residue presently located there that would make excavation difficult. The maximum height of the lagoons above existing ground would be approximately 30 feet. The interior of the berms would be lined with 10 feet of recompacted clay. In addition, an impermeable membrane liner would extend up those side slopes and tie into the final cover impermeable membrane liner.

The base grade liner system would consist of a 6 inch granular blanket on top which is covered with a filter cloth. A 5 foot clay liner would be placed below the granular blanket with a membrane liner. Installed near the bottom of the clay liner would be an impermeable membrane liner. The leachate collection system would be installed in the top of the clay liner. Underlying the first clay liner would be a 12 inch granular blanket which would drain to the underdrain system. A leachate collection under-

drain system would be installed below the 12 inch granular blanket which would route the leachate into manholes for disposal. Underlying the granular blanket would be another 5 foot recompacted clay liner. The liner system would consist of a total of 10 feet of clay and an impermeable membrane liner. The lagoons would also have primary and underdrain leachate collection systems to collect and route leachate for disposal.

The lagoons would be maintained as dry bottom sites and any leachate produced or collected in the leachate collection system would be treated. No slurry cutoff walls or relocation of utilities would be needed in the storage lagoon area.

Monitoring wells would be installed around the lagoons to monitor the effectiveness of the leachate collection systems and the liner. Since this facility would be constructed above ground, any migration of leachate would probably yield a discharge to the surface surrounding the lagoons. This requires that the lagoons be inspected frequently to detect for seepage from them.

The final cover for the lagoons would be the same as the parking lot areas except the lagoon would receive topsoil and be seeded, fertilized and mulched rather than paved with bituminous. With the placement of the impermeable membrane liner and the final cover, surface water infiltration is drastically reduced.

c. Summary of Costs

The following cost summary has been divided into several categories. Those categories are site preparation costs, operation and maintenance costs, site closure costs and long-term care costs. A detailed breakdown of this cost analysis is included in Appendix E for reference.

(1) Site Preparation Costs

Site preparation costs are those costs incurred in the development of the disposal facilities. For Option 5A those costs would include the following items: placement of clay liners, filter cloth, and granular blankets; installation of impermeable membrane; installation of leachate collection and underdrain systems; placement of slurry trench for dewatering and containment; relocation of utilities; construction of lagoon berms; construction of drainage swale; and, miscellaneous work. Option 5B would include the same costs as Option 5A except for the slurry trench cost for containment of materials in the crescent shaped ditch and oval lagoon areas.

TABLE 5
Site Preparation Costs - Option 5

	NORTH AREA MATERIAL	HARBOR MATERIAL	TOTAL
Option 5A	$3,481,000	$5,204,000	$8,685,000
Option 5B	$2,070,000	$5,204,000	$7,274,000

(2) Operation and Maintenance Costs

Operation and maintenance costs are the costs incurred during the placement of the contaminated materials in the disposal facilities. These costs include: personnel, equipment, record keeping, leachate collection and treatment, groundwater quality monitoring, etc. The costs for both Options 5A and 5B are $130,000 for the north area facility and $227,000 for the lagoon area.

(3) Site Closure Costs

Site closure costs are the costs incurred to abandon the disposal facilities when disposal operations have ceased. Work elements included are: placement of final cover, installation of bituminous pavement, impermeable membrane liner, and gas venting system, seeding, fertilizing and mulching; and miscellaneous work.

TABLE 9
Site Closure Costs - Option 5

	NORTH AREA MATERIAL	HARBOR MATERIAL	TOTAL
Option 5A	$848,000	$1,163,000	$2,007,000
Option 5B	$660,000	$1,163,000	$1,823,000

(4) Long-Term Care Costs

Long-term care costs are the costs to inspect and maintain a facility after its abandonment. Costs included in this option are: site inspections, site maintenance, (including grading, seeding, etc.), water quality and gas monitoring, leachate collection and treatment, and record-keeping. The costs for long-term care for the north area is $66,000 and for the harbor area is $66,000 for both options.

(5) Cost Summary

The following table summarizes the cost for Option 5.

TABLE 10
Cost Summary - Option 5A

COSTS	NORTH AREA	HARBOR MATERIAL	TOTAL
Site Preparation	$3,481,000	$5,204,000	$ 8,685,000
Operation and Maintenance	$ 130,000	$ 227,000	$ 357,000
Site Closure	$ 848,000	$1,163,000	$ 2,011,000
Long-Term Care	$ 66,000	$ 66,000	$ 132,000
TOTAL	$4,525,000	$6,660,000	$11,185,000

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TABLE 11
Cost Summary - Option 5B

COSTS	NORTH AREA	HARBOR MATERIAL	TOTAL
Site Preparation	$2,070,000	$5,204,000	$7,274,000
Operation and Maintenance	$ 130,000	$ 227,000	$ 357,000
Site Closure	$ 660,000	$1,163,000	$1,823,000
Long-Term Care	$ 66,000	$ 66,000	$ 132,000
TOTAL	$2,926,000	$6,660,000	$9,586,000

d. Summary - Option 5

Options 5A and 5B are somewhat similar in scope, except that Option 5A is more costly because of the site preparation cost involved with three disposal facilities (Option 5A) as opposed to two (Option 5B). Compared to Options 3 and 4, Options 5A and 5B are more costly because of the development of permanent storage lagoon facilities.

Favorable aspects of Options 5A and 5B include:

1. Minimum haul distances for disposing contaminated materials on-site.

2. Less intense development of disposal facilities in the OMC parking area, as only half the area will be a disposal area.

3. Minimal disruption of the oval lagoon and crescent-shaped ditch area (Option 5A).

4. Minimal leachate handling in the dry base storage lagoons which are constructed above ground.

Unfavorable characteristics of Options 5A and 5B are generally similar to those in Options 3 and 4; however, also include:

1. Design, development and maintenance of of multiple disposal and abatement facilities, especially, Option 5A.

2. Acquiring the use of the coke plant - OMC property for permanent disposal, as opposed to use as a temporary dewatering facility in Options 3 and 4.

3. The permanent storage of the material in an above ground facility is relatively unsightly, creates difficulties in maintaining the raised surface (as opposed to a flat surface) and, in addition, above ground storage severely limits potential end use of the land.

6. Option 6 - Slurry Cutoff Wall in the North Ditch Area and Lagoon Storage for Harbor Dredge Materials

a. Introduction

This option consists of constructing a slurry cutoff wall around the entire contaminated area in the north ditch area and disposing of the harbor dredge materials in permanent storage lagoons at the coke plant site. This requires no excavation of materials in the north ditch area and would create minimal disruption to the existing operations of OMC in that vicinity.

b. Engineering Features

The storage lagoons for the harbor dredge materials would be the same as utilized for Option 5. The liner systems, leachate collection systems, final cover systems, etc., would be the same and a discussion of them will not be repeated in this section. However, all earth materials used in the construction of the storage lagoons would be imported from off-site, as opposed to Option 5, which would partially utilize on-site materials excavated from the parking lot area.

Compared to the previously discussed options, this option maximizes abatement in the north ditch area. This option would construct a slurry cutoff wall around the perimeter of the north contaminated area and leave the contaminated materials in place. A general location of the cutoff wall is indicated on Drawing C 9400-12. The cutoff wall would be

excavated five feet into the underlying silt material and tied into that layer. An important factor in this option is the permeability and depth of the underlying silt layer. The construction procedures, and reliability of the bentonite slurry cutoff wall have been discussed before, and also apply to this option. Any utilities that cross the slurry cutoff wall would have to be removed and relocated.

A leachate collection system would be installed as indicated on Drawing C 9400-12. This leachate collection system would be installed approximately 4 feet below groundwater and would be utilized to maintain an inward gradient toward the containment facility. This would minimize the chance for migration of contaminated liquid out of the containment area through the slurry walls. The maintenance of an inward gradient requires monitoring of the groundwater level around the vicinity and the leachate level within the facility so the leachate level in the containment area is always lower than the groundwater. Leachate collected from this facility would have to be treated. Extensive groundwater monitoring wells would be installed to document the integrity of the slurry cutoff wall.

The area would probably be covered with clay materials and paved with bituminous paving as indicated in detail on Drawing C 9400-12. This method would create little disruption to OMC operations and their parking lot compared to other options.

If funding is limited at this time, it may be feasible to construct this slurry cutoff wall system to contain the waste in its present locations and limit further migration of the wastes. When additional funding is available, the materials could be excavated and placed in a secure disposal facility as discussed in previous options.

This adds minimal cost to the project since slurry cutoff walls probably would be required for dewatering to permit excavation of the contaminated materials.

c. Summary of Costs

The following cost summary has been divided into several categories. Those categories are site preparation, operation and maintenance costs, site closure costs, and long-term care costs. A detailed breakdown of this cost analysis is included in Appendix F for reference.

(1) Site Preparation Costs

Site preparation costs are the costs incurred in developing a facility for disposal of wastes. The factors included in the site preparation costs are as follows: placement of granular blanket and recompacted clay liner, installation of leachate collection system, underdrain system; filter cloth, and impermeable membrane liner, construction of drainage swales, etc., and miscellaneous work.

All the costs associated with the construction of the slurry cutoff wall and the containment of material in the northern area are covered in the Site Closure Costs. Site preparation costs for Option 6 include only costs associated with constructing the lagoons for the dredge materials. The site preparation costs for Option 6 are $7,005,000.

(2) Operation and Maintenance Costs

Operation and maintenance costs are the costs incurred in the day to day operation of the facility. Such costs include personnel, equipment, record keeping, water quality monitoring, and leachate collection and treatment. The operation and maintenance costs for this option are $250,000 per year, assuming that the disposal of wastes from this facility will be completed in one year from date of disposal operations initiation.

(3) Site Closure Costs

Site closure is the work associated with abandoning the facility when it has completed its operations. These costs include the placement of final cover, seeding, fertilizing and mulching, placement of the membrane liner, installation of gas venting trenches in the lagoon areas, and the costs for the north ditch area, including installation of the leachate collection system and slurry cutoff walls, and the placement of the final cover on the north area.

TABLE 12
Site Closure Costs - Option 6

North Ditch Area	$2,325,000
Dredge Materials	$1,163,000
TOTAL	$3,488,000

(4) Long-Term Care Costs

Long-term care includes the annual inspections and maintenance work necessary after the site has been abandoned to maintain its integrity and function. Such costs include site inspections, site grading, seeding to replace eroded areas, leachate collection and treatment, water quality and gas monitoring, and recordkeeping. The costs for long-term care are the same for both options, $66,000 for the north area and $66,000 for the dredged materials.

(5) Cost Summary

The following table summarizes the costs associated with Option 6.

TABLE 13
Cost Summary - Option 6

	NORTH AREA	HARBOR MATERIAL	TOTALS
Site Preparation	$ 0	$7,005,000	$ 7,005,000
Operation and Maintenance	$ 0	$ 250,000	$ 250,000
Site Closure	$2,325,000	$1,163,000	$ 3,488,000
Long-Term Care	$ 66,000	$ 66,000	$ 132,000
Total	$2,391,000	$8,484,000	$10,875,000

d. Summary - Option 6

This option maximizes the use of slurry cutoff wall abatement at the site, and similar to Option 5, proposes the use of the coke plant site for permanent disposal of the harbor dredgings. Cost-wise, this option is comparable to Option 5, mainly because of the expense of developing the permanent storage lagoon at the coke plant site.

Favorable aspects of this option are:

1. Minimal disruption of the OMC parking area.
2. Minimal handling of contaminated materials on-site, which minimizes exposure of the PCBs to the environment.

Unfavorable characteristics for this option are similar to that of Option 5 (multiple development, permanent storage at coke plant - OMC property), but also include:

1. Risk involved with the long-term reliability of the slurry cutoff wall around the entire north ditch area.

2. Because the slurry wall is a primary and long-term structure at the site and its' success partially depends on the underlying silt layer, this silt layer will have to be extensively documented within the proposed abatement area and in laboratory tests to determine its' suitability in developing this option.

7. Option 7 - Disposal of all Contaminated Materials in Lagoons at Coke Plant Location

a. Introduction

This option would construct a permanent storage lagoon at the coke plant site for disposal of the materials from the north ditch area and the materials dredged from the harbor.

b. Engineering Features

The construction of the lagoons includes a liner as detailed on Drawing C 9400-13. The liner, leachate collection and final cover systems utilized for this option are the same as the systems presented for the storage lagoons in Options 5 and 6 (see those discussions for design concepts).

The storage lagoons would be approximately 35 feet in height with a fill depth of 20 feet. The leachate collection system would be installed and a dry base maintained (see Drawing C 9400-13). The leachate would be collected and either treated on-site or transportec off-site for treatment.

No slurry cutoff wall system would be needed for this option since the facility would be constructed above ground. The facility would have to be monitored for seepage on the exterior of the berms and groundwater monitoring wells installed to assess the integrity of the clay liner systems.

c. Summary of Costs

The following cost summary has been divided into several categories. Those categories are site preparation costs, operation and maintenance costs, site closure costs, and long-term care costs. A detailed breakdown of this cost analysis is included in Appendix G for reference.

(1) Site Preparation Costs

Site preparation costs are the costs incurred in developing a facility for disposal of waste. For Option 7, factors included in the site preparation costs are as folows: placement of recompacted clay liners and granular blankets; installation of leachate collection in underdrain system; filter cloth and impermeable membrane liner; construction of drainage swale; and miscellaneous work. The site preparation cost for this option is $7,689,000.

(2) Operation and Maintenance Costs

Operation and maintenance costs are the costs incurred in the day to day operations of the facility. Such costs include personnel, equipment, record keeping, water quality monitoring, and leachate collection and treatment. The operation and maintenance costs for this Option is $350,000 per year. This is assuming that the disposal of the wastes will be completed within one year.

(3) Site Closure Costs

Site closure is the work associated with abandoning the facility when it has completed its operations. Costs included for this option are as follows: placement of final cover, including clay, topsoil and impermeable membrane, seeding, fertilizing and mulching, installation of gas vent trenches, and miscellaneous work. The site closure cost for Option 7 is $1,260,000.

(4) Long-Term Care Costs

Long-term care includes the annual inspection and maintenance work necessary if the site has been abandoned to maintain its integrity and function. Such costs include site inspections, site grading, seeding to replace eroded areas, leachate collection and treatment, water quality and gas monitoring, and recordkeeping. The costs for long-term care for this Option are $112,000.

(5) Cost Summary

The following table summarizes the costs for Option 7.

TABLE 14
Cost Summary - Option 7

Site Preparation	$7,689,000
Operation and Maintenance Costs	$ 350,000
Site Closure Costs	$1,260,000
Long-Term Care Costs	$ 112,000
TOTAL	$9,411,000

d. Summary - Option 7

Option 7 is somewhat similar to Option 3 in that only one permanent disposal area is developed, however, in the case of Option 7, it is the storage lagoons at the coke plant site. Cost-wise, Option 7 is slightly less costly than Options 5 and 6, mainly because of the site preparation costs involved only with the development of the above ground storage lagoons in Option 7, as opposed to multiple disposal areas. In contrast, Option 7 is somewhat more costly than Options 3 and 4, which emphasize disposal and/or abatement in the north ditch area.

Favorable aspects of Option 7 include:

1. The development of one permanent storage area at the OMC site.

2. Minimal long-term leachate handling in an above ground disposal facility.

3. Minimal haul distance of contaminated material.

4. Parking area disruptions would be only moderate, as only most contaminated soils would be removed to the storage area.

5. Removes disposal facility completely from OMC parking area, which would eliminate problems of returning the site to a parking area, as compared to if a land disposal site were developed on it.

6. The storage lagoon concept may be simpler to construct than other options on-site, as dewatering of the area is not necessary prior to construction and a cutoff wall is not necessary, yet, environmental protection is comparable with other on-site disposal options.

The only unfavorable aspects of this option are similar to those previously mentioned in regard to the permanent storage lagoons at the coke plant site, including; relative unsightliness, long-term maintenance of the surface, and limiting the end use of the property.

D. Discussion of Options 1 through 7

Seven main options have been evaluated for disposing of the PCB contaminated materials from both the north ditch area and the harbor dredge materials. Two of these options are off-site facilities (Options 1 and 2), while the remaining five (Options 3 through 7) consider various on-site disposal alternatives. For comparative purposes, Table 15 presents a summary of the costs associated with each option.

1. Off-Site Disposal Options

In comparing the two off-site disposal options, both are located in sparsely populated areas, have favorable on-site soils for development and the site managements are willing to accept the wastes at their sites. CECOS has an added advantage in that it is already licensed for PCB disposal. However, the most important factor is that the BFI facility presents a much lower cost than the CECOS facility, because of the high costs of hauling to, and disposal at, the CECOS site. Tom Cavanaugh, of Illinois EPA's Landfill Permitting Section, has indicated that obtaining a permit to dispose of the PCB contaminated materials at the BFI facility would be possible.

Therefore, we recommend the BFI site over the CECOS site for disposal of the PCB contaminated materials, provided that the additional physical investigations of the site be carried out per our recommendations (refer to summary of BFI Section). Further, we recommend that the CECOS site be used only if the use of the BFI site and the on-site options become unfeasible, because of the extreme costs involved with using the CECOS site.

TABLE 15
SUMMARY OF OPTIONS

OPTION		(1) SITE PREPARATION	(2) OPERATION & MAINTENANCE	(3) SITE CLOSURE	(4) LONG-TERM CARE	TOTAL 1 - 4	USER COST Disposal	USER COST Trans.	TOTAL USER COSTS
1A (BFI)		$1,365,000	$350,000	$ 422,000	$112,000	$ 2,249,000	$14,680,000	$ 3,670,000	$18,350,000
1B (BFI)		$1,573,000	$350,000	$ 424,000	$112,000	$ 2,459,000	$14,680,000	$ 3,670,000	$18,350,000
2 (CECOS)		$1,162,000	$350,000	$ 323,000	$112,000	$ 1,947,000	$33,030,000	$23,855,000	$56,885,000
3 (OMC)		$5,852,000	$350,000	$1,463,000	$112,000	$ 7,777,000			
4 (OMC)		$5,973,000	$350,000	$1,544,000	$112,000	$ 7,979,000			
5A (OMC)	a.	$3,481,000	$130,000	$ 848,000	$ 66,000	$ 4,525,000			
	b.	$5,204,000	$227,000	$1,163,000	$ 66,000	$ 6,660,000			
	c.	- - - - - -	- - - - - -	- - - - - -	- - - - - -	$11,185,000			
5B (OMC)	a.	$2,070,000	$130,000	$ 660,000	$ 66,000	$ 2,926,000			
	b.	$5,204,000	$227,000	$1,163,000	$ 66,000	$ 6,660,000			
	c.	- - - - - -	- - - - - -	- - - - - -	- - - - - -	$ 9,586,000			

a. North Ditch Area
b. Storage Lagoons for Dredge Materials
c. Total, a + b

CONTINUED

TABLE 15
SUMMARY OF OPTIONS
(continued)

OPTION		SITE PREPARATION	OPERATION & MAINTENANCE	SITE CLOSURE	LONG-TERM CARE	TOTAL	USER COST Disposal	USER COST Trans.	TOTAL USER COSTS
6 (OMC)	a.	----------	--------	$2,325,000	$ 66,000	$ 2,391,000			
	b.	$7,005,000	$250,000	$1,163,000	$ 112,000	$ 8,484,000			
	c.	- - - - - - - - - -	- - - - - - - -	- - - - - - - -	- - - - - - -	$10,875,000			
7 (OMC)		$7,689,000	$350,000	$1,260,000	$112,000	$ 9,411,000			

NOTES:
1) All Disposal facilities utilize a clay liner, leachate collection, underdrain and final cover systems.
2) Refer to the text for a description of work elements included under cost headings: Site Preparation, Operation and Maintenance, Long-Term Care, and User.
3) Options 3 to 7 are new facilities and would be constructed to comply with existing regulations.
4) Illinois EPA requires all hazardous facilities to make a deposit of $2.02/cy fee in a special fund, which is not included in any of the above costs.
5) See Appendices A through I for cost preparation data.

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2. On-Site Options

On-site disposal options evaluated range from:

1. Disposing of the materials in a completely underground facility to

2. Containing some of the contaminated material in-place utilizing a slurry cutoff wall to

3. Disposing of all the materials in an above ground facility, and

4. Various combinations of the above.

Cost-wise, Table 15 indicates that the cost of various on-site options exhibit a moderate range. Thus, cost does not become a major consideration in choosing one on-site option over another.

Each of the five on-site options have certain favorable and unfavorable characteristics, which have been discussed in the individual summaries of each option. The aspects considered for each option include disruption to the OMC parking lot area (intensity of development), reliability, simplicity and long-term maintenance of design and construction methods, on-site handling of the PCB contaminated materials and final use.

Comparison of both costs and the favorable and unfavorable aspects of all the on-site options indicate that two of the on-site options appear somewhat more favorable than the others; and include:

Option 3 - Total On-Site Excavation and Disposal in Parking Lot

Option 7 - Disposal of All Contaminated Materials in Lagoons at Coke Plant Location

These two options emerge from the group, based on their simplicity of construction, relative reliability of construction methods, minimal on-site disruption (as opposed to multiple developments) and minimal long-term care associated with one facility. Both options consider only one area as a permanent disposal facility, which would include all wastes from the harbor and OMC property.

It was felt that the multiple disposal facilities cause significant overall site disruption and would add significantly to long-term maintenance measures. Further, the long-term reliability of the clay slurry cutoff makes those options that use it as a primary containing element somewhat less attractive, especially Option 6, which confines the entire north ditch area by slurry cutoff.

Comparing Options 3 and 7, we choose Option 3 as the slightly more workable alternative, because it utilizes underground disposal space rather than above ground. The parking lot will be disrupted severely during construction of Option 3, but, it can be returned to its parking lot use.

In contrast, permanent disposal above ground, at the coke plant site in Option 7, would severely limit the potential end use of the land. Further, we indicated that an above ground facility would probably require greater long-term maintenance (especially a grassed surface) compared to an asphalt surface. However, above ground disposal may have advantages over below ground (and below water table) disposal, in that above ground disposal minimizes leachate production and precludes dewatering of the construction area for development. Also, stockpiling of contaminated sediments is generally eliminated in the above ground option. These impacts should be considered more closely in a detailed investigation to define the relative development potential of these two options.

In particular, the hydrogeology of the OMC area must be better defined to determine the soil and groundwater conditions in the parking lot and the plant sites. Documentation of the underlying silt layer in the vicinity of the parking lot is especially important in defining the ultimate developability of Option 3.

As with all the on-site options, the disposal of PCB contaminated materials at the OMC property may be contingent upon:

1. The permission of OMC management.

2. The acceptability of these options to the Illinois EPA.

3. Presently unidentified socio-political opposition.

3. Comparison of Recommended Off-Site and On-Site Disposal Options

The comparison of the on-site alternatives to the off-site alternatives is made difficult by the lack of information regarding:

1. OMC's position on permanent disposal on-site and long-term care commitments.

2. The political acceptability of on-site disposal with respect to IEPA and potential local opposition to on-site disposal.

3. The feasilibity of on-site disposal as determined from on-site hydrogeological investigations.

4. Final design concepts for either the BFI site or on-site disposal options.

5. The relative quickness in which the BFI site or on-site options could be licensed for PCB disposal by State and Federal Agencies (on-site licensing would obviously be slower).

6. Site specific feasibility investigations at the BFI site.

Based on costs, the on-site options appear to be more attractive than disposal at the BFI site, but, despite cost, BFI would likely be much easier to license and develop. However, it is premature to make decisions as to the most desirable option until the recommended investigations are performed.

PROCEDURES REQUIRED FOR PERMITTING SITES FOR DEVELOPMENT

Removal, transport and disposal of the OMC PCB waste is regulated by various Federal, State and Local agencies. The Federal agencies which have jurisdiction are the United States Environmental Protection Agency (EPA) and the United States Department of Transportation (DOT). Depending on which state (Illinois or Ohio) disposal of the waste material takes place in, the Illinois Environmental Protection Agency or the Ohio Environmental Protection Agency will be the State Regulatory Body. Local governments have jurisdication in the form of zoning and land use ordinances. These would affect disposal if a new hazardous waste site were being proposed or if an existing solid waste disposal facility were to be upgraded to accept hazardous waste material. Table 16 lists permits required for disposal of the PCB waste. The following discussion outlines the purpose and procedure for obtaining the permits.

A. Federal

The Toxic Substances Control Act (TSCA) 1976 requires premarket toxicological testing of all new chemicals and imposes strict regulations governing their use, sale and disposal. Broad powers are given for banning, limiting or modifying use, manufacturing and processing of a substance which could pose an unreasonable risk to human health or to the environment. PCB Disposal is strictly regulated under provisions of this Act.

TABLE 16
SUMMARY OF REGULATORY REQUIREMENTS

Disposal Option	Regulatory Agency	Regulatory Authority	Permit Req'd	Type of Permit Required
On-Site Storage & Processing (Temporary)	Illinois EPA	Illinois Environmental Protection Agency	Yes	NPDES - For Effluent Returning to Surface Water IEPA - For Construction of Processing & Storage Facility
	USEPA	TSCA	Yes	USEPA - For Construction of PCB Handling Facility
On-Site Disposal	Illinois EPA	Illinois Environmental Protection Agency	Yes	IEPA - Permit to Develop and/or Operate a Solid Waste Management Site
	USEPA	TSCA	Yes	EPA - Permit to Dispose of PCB Waste Material
Disposal at Browning-Ferris Industries (BFI) Site	Illinois EPA	Illinois Environmental Protection Agency	Yes	IEPA - Supplemental Permit for Special Waste Handling at Existing Solid Waste Disposal Site
	USEPA	TSCA	Yes	USEPA - For Construction of PCB Disposal Facility
Disposal at CECOS Site	Ohio EPA	Ohio Revised Code Section 3734	No*	
	USEPA	TSCA	No*	

* The CECOS Site is currently licensed by the Ohio EPA and the USEPA to receive PCB waste.

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The May 31, 1979 Federal Register contains the final rule implementing provisions of the Toxic Substances Control Act (TSCA) 40 CFR Part 761 prohibiting the manufacture, processing, distribution in commerce and use of PCB's. Annex II of TSCA specifies the licensing procedure for obtaining EPA approval.

Prior to the disposal of any PCB's or PCB items, the owner or operator of the landfill shall receive written approval from the EPA Regional Administrator for the region in which the landfill is located.

The owner or operator shall submit to the regional administrator a detailed initial report describing physical site conditions, outlining the design and operating procedures, and other information the regional administrator deems to be necessary to make a final determination. Specific information which must be included is listed in the May 31, 1979 rules.

Implementing any of the disposal options in Illinois will require a permit to be obtained under provisions of this Act. Disposal of the waste at the CECOS site in Ohio is acceptable because that site has a permit to accept PCB waste material. Temporary processing and storage on-site will require approval also.

The Hazardous Materials Transportation Act, 1974, regulates transportation of a wide range of substances including toxic chemicals. The act sets standards for containers and requires registration of transporters. These regulations have been revised in 1980 to explicitly address the transportation hazards of waste materials. In addition, the revised transportation rules governing hazardous waste apply to intrastate as well as the interstate transportation of waste.

B. State

If the PCB waste material is disposed of in the State of Illinois, the Illinois Enviromental Protection Agency (IEPA) will require a permit or supplemental permit to be granted under the State of Illinois Environmental Protection Act. These permits will be required both for the development of a new facility or upgrading of an existing facility respectively. IEPA has indicated that the simplest option to pursue would be to obtain a supplemental permit to dispose of the PCB waste at the BFI site. They have also stated that they would oppose permanent on-site disposal of the PCB waste.

The Ohio disposal option includes transport and disposal of the PCB waste at the CECOS Land Disposal site in Clermont County, Ohio, a licensed PCB disposal site. The Ohio Environmental Protection Agency (OEPA) does not require additional permits for disposal of the PCB waste at the CECOS hazardous waste disposal site. That site is currently licensed to accept PCB waste between 50-500 ppm and will not require any special permitting procedures for the waste to be deposited there.

The following discussion will describe the regulatory requirements for disposal of PCB wastes in Illinois. Two disposal options are being considered in Illinois. Those options are: 1) On-site disposal at the OMC Waukegan site, and 2) transport to the Browning-Ferris Industries (BFI) land disposal site. The BFI site is not currently licensed to accept PCB waste.

Since exercising of either option for disposal of the PCB waste in Illinois will require submission of similar information and compliance with the same regulations, the procedure will be outlined only once. Implementing the option of disposing of the PCB waste at the BFI site may be somewhat less time consuming and expensive, since much of the on-site information which is required to be submitted has been gathered and compiled. Preparation of supplemental data would be required to license that site as a PCB disposal area. The procedures outlined do not address any waivers or special treatment which the IEPA or USEPA deem necessary for disposal or temporary storage of the PCB waste.

The procedures for application to expand an existing land disposal site or create a new land disposal site are specified in the State of Illinois Environmental Protection Act, Public Act 76-2429, with the application criteria delineated in the permit application pamphlet, Application For Permit To Develop and/or Operate A Solid Waste Management Site.

By complying with the requirements of the above referenced act, and including the required information in the application pamphlet, the applicant can initiate IEPA review procedures. In some cases, IEPA will request preliminary site information from the Illinois State Geological Survey to assist in forming a tentative opinion of the suitabiliy of the proposed site for use as a solid waste disposal site. Upon request and submission of a legal description of the site by the applicant, IEPA will render a tentative opinion. An unfavorable report does not imply that the site cannot be changed to remove, correct, or modify the limitations. Rather, the use of the site will depend on the kind of limitations, and whether or not these can be altered successfully and economically. The

OMC-WAUKEGAN
OMC SITE - OPTION 5A
SITE CLOSURE - (NORTH AREA DISPOSAL)

Item	Quantity	Unit Cost	Cost
Final Cover			
Parking Lot	40,334 c.y.	$9.00/c.y.	$363,006.00
Gas Venting System			
Gravel	1,262 tons	$6.00/ton	$ 7,572.00
Vents	3	$200/each	$ 600.00
Liner -			
PVC Membrane	304,920 s.f.	$0.35/s.f.	$106,722.00
Bituminous			
Pavement	370,599 s.f.	$0.55/s.f.	$203,829.45
Final cover			
In-situ Disposal	5,000 c.y.	$9.00/c.y.	$ 45,000.00
Gas Venting System			
In-Situ Disposal			
Gravel	567 tons	$6.00/ton	$ 3,402.00
Vents	2	$200/each	$ 400.00
Liner -			
PVC Membrane	45,000 s.f.	$0.35/s.f.	$ 15,750.00
Topsoil	833 c.y.	$9.00/c.y.	$ 7,497.00
Seed, Fertilize			
and Mulch	5,000 s.y.	$0.32/s.y.	$ 1,600.00
Engineering		Lump Sum	$ 15,000.00
		Subtotal	$770,378.45
		10% Contingency	$ 77,037.85
		TOTAL	$847,416.30[1]

Note:

1. These quantities and costs are based on present information of site conditions and should be considered approximate.

2. See Appendix H for Site Operation and Long-Term Care Costs.

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OMC-WAUKEGAN
OMC SITE - OPTION 5A
SITE PREPARATION - (HARBOR MATERIAL DISPOSAL)

Costs

Item	Quantity	Unit Cost	Cost
General Fill Material	164,250 c.y.	$7.50/c.y.	$1,231,875.00
Clay Liner	309,288 c.y.	$9.00/c.y.	$2,783,592.00
Granular Material	21,074 c.y.	$7.50/c.y.	$ 158,055.00
Filter Cloth	379,320 s.f.	$0.11/s.f.	$ 41,725.20
Liner - PVC Membrane	715,078 s.f.	$0.35/s.f.	$ 250,277.30
Leachate Collection System			
Pipe	4,250 l.f.	$7.50/l.f.	$ 31,875.00
Manhole	($595 + (20'-8')$78 + $160) 12[1]		$ 20,292.00
Underdrain System			
Pipe	3,400 l.f	$7.50/l.f.	$ 25,500.00
Manhole	($595 + (26'- 8')$78 + $160) 8[1]		$ 17,272.00
Drainage Swale	4,476 l.f.	$3.50/l.f.	$ 15,666.00
Topsoil Berms	7,232 c.y.	$9.00/c.y.	$ 65,088.00
Seed, Fertilize, Mulch	43,394 s.y.	$0.32/s.y.	$ 13,886.00
Engineering		Lump Sum	$ 75,000.00
		Subtotal	$4,730,103.50
		10% Contingency	$ 473,010.35
		TOTAL	$5,203,113.85[2]

Notes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

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OMC-WAUKEGAN
OMC SITE - OPTION 5A
SITE CLOSURE - (HARBOR MATERIAL DISPOSAL)

Item	Quantity	Unit Cost	Cost
Final Cover	79,359 c.y	$9.00/c.y.	$ 714,231.00
Topsoil	10,580 c.y.	$9.00/c.y.	$ 95,220.00
Liner - PVC Membrane	599,950 s.f.	$0.35/s.f.	$ 209,982.50
Gas Venting			
Gravel	107 tons	$6.00/ton	$ 642.00
Vents	6	$200/each	$ 1,200.00
Seed, Fertilize, Mulch	63,487 s.y.	$0.32/s.y.	$ 20,315.84
Engineering		Lump Sum	$ 15,000.00
		Subtotal	$1,056,591.34
		10% Contingency	$ 105,659.13
		TOTAL	$1,162,250.47[1]

Note:

1. These quantities and costs are based on present information of site conditions and should be considered approximate.

2. See Appendix H for Site Operation and Long-Term Care Costs.

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OMC-WAUKEGAN
OMC SITE - OPTION 5B
SITE PREPARATION-(NORTH AREA DISPOSAL)

Costs

Item	Quantity	Unit Cost	Cost
Excavation	242,274 c.y.	$1.00/c.y.	$ 242,274.00
On-site Disposal of Excavated Material	242,274 c.y.	$1.50/c.y.	$ 363,411.00
Recompacted Clay	74,917 c.y.	$9.00/c.y.	$ 674,253.00
Filter Cloth	135,200 s.f.	$0.11/s.f.	$ 14,872.00
Granular Material	7,511 c.y.	$2.50/c.y.	$ 18,777.50
Liner - PVC Membrane	285,595 s.f.	$0.35/s.f.	$ 99,958.25
Leachate Collection System			
Pipe	1,957 l.f.	$7.50/l.f.	$ 14,677.50
Manhole	($595 + (23'- 8')$78 + $160) 6[1]		$ 11,550.00
Underdrain System			
Pipe	1,704 l.f	$7.50/l.f	$ 12,780.00
Manhole	($595 + (29'- 8')$78 + $160)4[1]		$ 9,572.00
Slurry Trench Dewatering	87,500 s.f.	$3.50/s.f.	$ 306,250.00
Drainage Swale	2,300 l.f.	$3.50/l.f.	$ 8,050.00
Relocate Utilities		Lump Sum	$ 30,000.00
Engineering		Lump Sum	$ 75,000.00
		Subtotal	$1,881,425.25
		10% Contingency	$ 188,142.53
		TOTAL	$2,069,567.78[2]

Notes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

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OMC-WAUKEGAN
OMC SITE - OPTION 5B
SITE CLOSURE - (NORTH AREA DISPOSAL)

Item	Quantity	Unit Cost	Cost
Final Cover			
Parking Lot	36,942 c.y.	$9.00/c.y.	$332,478.00
Gas Venting System			
Gravel	1,212 tons	$6.00/ton	$ 7,272.00
Vents	3	$200/each	$ 600.00
Liner -			
PVC Membrane	279,279 s.f.	$0.35/s.f.	$ 97,747.65
Bituminous			
Pavement	265,980 s.f.	$0.55/s.f.	$146,289.00
Engineering		Lump Sum	$ 15,000.00
		Subtotal	$599,386.65
		10% Contingency	$ 59,938.67
		TOTAL	$659,325.32[1]

Note:

1. These quantities and costs are based on present information of site conditions and should be considered approximate.

2. See Appendix H for Site Operation and Long-Term Care Costs.

OMC-WAUKEGAN
OMC SITE - OPTION 5B
(HARBOR MATERIAL DISPOSAL)

Costs For Both Site Preparation And Site Closure Are The Same As OMC SITE - OPTION 5A.

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APPENDIX F

OMC SITE - OPTION 6

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above preliminary site determination will help to eliminate some of the expense to the applicant of preparing plans and reports for a site which is unsuitable or where such use might be uneconomical.

Immediately upon receipt of a request for a permit or supplemental permit for a refuse disposal facility, IEPA will notify the State's Attorney and the Chairman of the County Board of the County in which the facility is located along with each member of the General Assembly from the legislative district in which the proposed facility is located and to the Clerk of each municipality within three miles of the proposed facility. Prior to the issuance of a permit to develop a hazardous waste disposal site, IEPA shall conduct a public hearing in the County where the site is proposed to be located.

IEPA has 180 days after the filing of the application for permit to reject or approve the application. The 180-day time period includes the public hearing procedure which is required for a hazardous waste landfill permit.

If IEPA refuses to grant a permit for the development of a land disposal site, the applicant may, within 35 days, petition for a hearing before the Pollution Control Board to contest the decision of IEPA. After a 21-day public notice period, the Pollution Control Board has 90 days to respond to the applicant. In addition, if IEPA grants a permit to develop a hazardous waste disposal site, a third party, other than the permit applicant or IEPA, may petition the Pollution Control Board within 35 days for a hearing to contest the issuance of the permit. The above time limitations also apply to this hearing request. The hearing will not be granted if the Pollution Control Board determines that the hearing would be a duplication of previous hearings or information already received.

Upon approval of the permit application, the applicant may begin site preparation work. The applicant must notify IEPA in writing when the development of the site has been completed for the required pre-operation site inspection. An operating permit will be issued if the site development is in accordance with the development permit.

The State of Illinois Environmental Protection Act creates a "hazardous waste fund" which will be comprised from the fees collected pursuant to Section 22.2 of the above Act. That Section specifies a fee in the amount of 1¢ per gallon or $2.02 per cubic yard of hazardous wastes received on and after the effective date of procedures established by IEPA not later than April 1, 1980. The fee will be paid by the owner or operator of the hazardous waste disposal site.

C. Local

Presently, there are no local zoning or land use ordinaces preventing PCB disposal at the Browning-Ferris Industries (BFI) site. Some public opposition to disposal of the PCB wastes at that site will likely occur, but it is not expected that the opposition could prevent disposal of the PCB dredge materials at the site. The BFI site has been licensed to accept PCB waste in the past and therefore complies with local ordinances.

On-site disposal of the PCB waste material would not be affected by any local zoning or land use ordinances. Temporary storage of the waste materials or permanent on-site disposal may meet with public opposition but it is uncertain as to whether this opposition could prevent exersizing that alternative.

The CECOS site in Ohio is currently licensed to accept PCB waste and therefore complies with all existing zoning or land use ordinances.

D. Transportation of PCB Waste

A transporter may not handle hazardous wastes without an EPA identification number, which can be obtained by using EPA Form 8700-12. Both the EPA and the DOT regulate transportation of PCB wastes. The DOT regulates the transportation of hazardous wastes under the authority provided by the Hazardous Materials Transportation Act of 1978. These regulations have been revised during 1980 to explicitly address the transportation hazards of waste materials. In addition, the revised transportation rules governing hazardous waste applied to intrastate as well as the interstate transporation of waste.

Both shippers and transporters of hazardous waste must comply with DOT's special requirements concerning the classification, description, packaging, marking, labeling and preparation for shipping of these materials. The shipper must appropriately package and mark the waste materials, comply with certain record-keeping requirements that duplicate the EPA rules, and certify that the materials offered for transport are in compliance with the applicable DOT rules.

The transporter assumes the obligation to specially mark each motor vehicle used to carry hazardous waste regardless of the amount of waste transported.

SUMMARY AND RECOMMENDATIONS

As a result of this study, we provide the following summary and recommendations:

1. Disposal of the PCB contaminated sediments at the BFI site is more cost effective than disposal at the CECOS-Williamsburg, Ohio, site based primarily on the high costs of transportation and disposal at the CECOS site.

2. On-site disposal Options 3 and 7 at the OMC property appear to be the most feasible based on simplicity of construction, minimal long-term care factors and minimal on-site disruption during construction. Option 3 has wastes from the harbor and north ditch area disposed underground in a secured landfill developed in the parking lot area, while Option 7 disposes the waste in an above ground storage lagoon facility at the nearby coke plant site.

3. A decision as to which of the on-site (Options 3 and 7) or off-site (BFI) disposal alternatives is most desirable cannot be made until more detailed investigations are performed. Based on the cost of disposal above, the on-site options appear to be more cost effective.

4. It may be advisable to presently install a slurry cutoff wall around the north ditch area to limit further migration of the PCB contamination. Hydrogeolgical investigations to further assess the potential on-site disposal developability are necessary to implement this abatement procedure.

5. Site specific studies need to be performed at both the BFI and OMC sites to further assess what potential modifications are required to accommodate PCB disposal in an environmentally sound manner.

6. The CECOS site should be considered for PCB disposal only after all other options are considered unfeasible based on unexpectd socio-political opposition or technical consideration which would prohibit development at the recommended sites.

7. If an on-site disposal option is considered desirable, a clay borrow search should be conducted to identify potential sources of clay liner and capping materials.

CLOSING REMARKS

We trust that this investigation has been performed to your satisfaction and is consistent with your needs. We enjoyed the opportunity to serve Mason Hanger-Silas Mason Company, Inc. and look forward to future working relationships.

If you have any questions or comments about the content or conclusions of this report, please contact us.

Respectfully submitted,

WARZYN ENGINEERING INC.

Roger C. Cooley

Roger C. Cooley, P.E.
Project Engineer

Daniel W. Hall

Daniel W. Hall, CPGS
Project Manager

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ENGINEERING INC

APPENDIX A

BFI SITE OPTION 1A and OPTION 1B

WARZYN
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OMC-WAUKEGAN
BFI SITE - OPTION 1A
(20' ABOVE/10' BELOW GND SURFACE)
COSTS - SITE PREPARATION

Item	Quantity	Unit Cost	Cost
Excavation	312,851 c.y.	$1.00/c.y.	$ 312,851.00
Granular Blankets	25,827 c.y.	$7.50/c.y.	$ 193,702.50
Recompacted Clay Liner	129,709 c.y.	$1.50/c.y.	$ 194,563.50
Excavate & Recompact Clay Below Underdrain	34,436 c.y.	$2.50/c.y.	$ 86,090.00
Leachate Collection System			
Pipe	3,371 l.f.	$7.50/l.f.	$ 25,282.50
Manhole	($595 + (25'-8')$78 + $160) 6[1]		$ 12,486.00
Underdrain System			
Pipe	2,830 l.f.	$7.50/l.f.	$ 21,225.00
Manhole	($595 + (31'-8')$78 + $160) 4[1]		$ 10,196.00
Filter Cloth	464,880 s.f.	$0.11/s.f.	$ 51,136.80
Liner - PVC Membrane	608,482 s.f.	$0.35/s.f.	$ 212,968.70
Strip Topsoil	9,959 c.y.	$0.85/c.y.	$ 8,465.15
Drainage Swale	3,154 l.f.	$3.50/l.f.	$ 11,039.00
Engineering		Lump Sum	$ 100,000.00
		Subtotal	$1,240,006.15
		10% Contingency	124,000.62
		TOTAL	$1,364,006.77[2]

Notes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

WARZYN ENGINEERING INC

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OMC-WAUKEGAN
BFI SITE - OPTION 1A
(20' ABOVE/10' BELOW GND SURFACE)
SITE CLOSURE

Item	Quantity	Unit Cost	Cost
Final Cover Placement	77,370 c.y.	$1.30/c.y.	$ 100,581.00
Topsoil Placement	61,896 s.y.	$0.30/s.y.	$ 18,568.80
Seed, Fertilizer & Mulch	61,896 s.y.	$0.32/s.y.	$ 19,806.72
Liner - PVC Membrane	584,917 s.f.	$0.35/s.f.	$ 204,720.95
Gas Venting			
Gravel	2,211 tons	$6.00/ton	$ 13,266.00
Vents	5	$200/each	$ 1,000.00
Engineering		Lump Sum	$ 25,000.00
		Subtotal	$ 382,943.47
		10% Contingency	$ 38,294.35
		TOTAL	$ 421,237.82[1]

Note:

1. These quantities and costs are based on present information of site conditions and should be considered approximate.

2. See Appendix H for Site Operation and Long-Term Care Costs.

WARZYN ENGINEERING INC

OMC-WAUKEGAN
BFI SITE - OPTION 1B
(BELOW GND SURFACE)
SITE PREPARATION

Item	Quantity	Unit Cost	Cost
Excavation	505,011 c.y.	$1.00/c.y.	$ 505,011.00
Granular Blankets	24,197 c.y.	$7.50/c.y.	$ 181,477.50
Recompacted Clay	134,158 c.y.	$1.50/c.y.	$ 201,237.00
Excavate & Recompact Clay below Underdrain	31,835 c.y.	$2.50/c.y.	$ 79,587.50
Leachate Collection System			
Pipe	3,271 l.f.	$7.50/l.f.	$ 24,532.50
Manhole	($595 + (25' - 8') $78 + 160) 6[1]		$ 12,486.00
Underdrain System			
Pipe	2,646 l.f.	$7.50/l.f.	$ 19,845.00
Manhole	($595 + (31' - 8') $78 + 160) 4[1]		$ 10,196.00
Drainage Swale	3,254 l.f.	$3.50/l.f.	$ 11,389.00
Filter Cloth	435,540 s.f.	$0.11/s.f.	$ 47,909.40
Strip Topsoil	10,992 c.y.	$0.85/c.y.	$ 9,343.20
Liner - PVC Membrane	647,332 s.f.	$0.35/s.f.	$ 226,566.20
Engineering		Lump Sum	$ 100,000.00
		Subtotal	$1,429,580.30
		10% Contingency	$ 142,958.03
		TOTAL	$1,572,538.33[2]

Notes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

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OMC-WAUKEGAN
BFI SITE - OPTION 1B
(BELOW GND SURFACE)
SITE CLOSURE

Item	Quantity	Unit Cost	Cost
Final Cover Placement	77,459 c.y.	$1.30/c.y.	$100,696.70
Topsoil Placement	61,967 s.y.	$0.30/s.y.	$ 18,590.10
Seed, Fertilize and Mulch	61,967 s.y.	$0.32/s.y.	$ 19,829.44
PVC Liner	585,588 s.f.	$0.35/s.f.	$204,955.80
Gas Venting			
Gravel	2454 tons	$6.00/ton	$ 14,724.00
Vents	5	$200.00/each	$ 1,000.00
Engineering		Lump Sum	$ 25,000.00
		Subtotal	$384,796.04
		10% Contingency	$ 38,479.60
		TOTAL	$423,275.64[1]

Note:

1. These quantities and costs are based on present information of site conditions and should be considered approximate.

2. See Appendix H for Site Operation and Long-Term Care Costs.

WARZYN ENGINEERING INC

APPENDIX B

CECOS - WILLIAMSBURG - OPTION 2

WARZYN
ENGINEERING INC

OMC-WAUKEGAN
CECOS - WILLIAMSBURG - OPTION 2
SITE PREPARATION

Costs

Item	Quantity	Unit Cost	Cost
Excavation	489,032 c.y.	$1.00/c.y.	$ 489,032.00
Strip Topsoil	7,420 c.y.	$0.85/c.y.	$ 6,307.00
Recompact Clay Liner	137,411 c.y.	$1.50/c.y.	$ 206,116.50
Granular Blankets	7,905 c.y.	$7.50/c.y.	$ 59,287.50
Lir -- PVC .embrane	445,213 s.f.	$0.35/s.f.	$ 155,824.55
L chate Collection System			
Pipe	2,260 l.f.	$7.50/l.f.	$ 16,950.00
Manhole	6 ($595 + (42'- 8')$78 + $160)[1]		$ 20,442.00
Underdrain System			
Pipe	1,350 l.f.	$7.50/l.f.	$ 10,125.00
Manhole	4($595 + (60.5'- 8')$78 + $160)[1]		$ 19,400.00
)rainage ;wale	2,448 l.f.	$3.50/l.f.	$ 8,568.00
ilter Cloth	213,444 s.f.	$0.11/s.f.	$ 23,478.84
ngi ering		Lump Sum	$ 40,000.00
		Subtotal	$1,055,531.39
		10% Contingency	$ 105,553.14
		TOTAL	$1,161,084.53[2]

)tes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

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OMC-WAUKEGAN
CECOS - WILLIAMSBURG - OPTION 2
SITE CLOSURE

Costs

Item	Quantity	Unit Cost	Cost
Final Cover Placement	83,890 c.y.	$1.30/c.y.	$109,057.00
Topsoil Placement	40,267 s.y.	$0.30/s.y.	$ 12,080.10
Seed, Fertilize & Mulch	40,267 s.y.	$0.32/s.y.	$ 12,885.44
PVC Liner	380,524 s.f.	$0.35/s.f.	$133,183.40
Gas Venting			
Gravel	813 tons	$6.00/ton	$ 4,878.00
Vents	5	$200/each	$ 1,000.00
Engineering		Lump Sum	$ 20,000.00
		Subtotal	$293,083.94
		10% Contingency	$ 29,308.39
		TOTAL	$322,392.33[1]

Note:

1. These quantities and costs are based on present information of site conditions and should be considered approximate.

2. See Appendix H for Site Operation and Long-Term Care Costs.

WARZYN ENGINEERING INC

APPENDIX C

OMC SITE - OPTION 3

WARZYN
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OMC-WAUKEGAN
OMC SITE - OPTION 3
SITE PREPARATION

Item	Quantity	Unit Cost	Cost
Excavation	621,013 c.y.	$1.00/c.y.	$ 621,013.00
Slurry Trench - Dewatering	154,000 s.f.	$3.50/s.f.	$ 539,000.00
Clay Liner	288,156 c.y.	$9.00/c.y.	$2,593,404.00
Granular Blankets	13,046 c.y.	$2.50/c.y.	$ 32,615.00
Filter Cloth	208,104 s.f.	$0.11/s.f.	$ 22,891.44
PVC Membrane - Liner	752,759 s.f.	$0.35/s.f.	$ 263,465.65
Leachate Collection System			
Pipe	3,568 l.f.	$7.50/l.f.	$ 26,760.00
Manhole	($595 + (37'- 8')$78 + $160) 8[1]		$ 24,136.00
Underdrain System			
Pipe	3,235 l.f.	$7.50/l.f.	$ 24,262.50
Manhole	($595 + (39.5'-8')$78 + $160) 6[1]		$ 19,272.00
On-site Disposal of Excavated Material	625,609 c.y.	$1.50/c.y.	$ 938,413.50
Drainage Swale	4,100 l.f.	$3.50/l.f.	$ 14,350.00
Relocate Utilities		Lump Sum	$ 50,000.00
Engineering		Lump Sum	$ 150,000.00
		Subtotal	$5,319,583.09
		10% Contingency	$ 531,958.31
		TOTAL	$5,851,541.40[2]

Notes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

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OMC-WAUKEGAN
OMC SITE - OPTION 3
SITE CLOSURE

Item	Quantity	Unit Cost	Cost
Final Cover Placement	77,916 c.y.	$9.00/c.y.	$ 701,244.00
Gas Venting			
Gravel	2,484 tons	$6.00/ton	$ 14,904.00
Vents	6	$200/each	$ 1,200.00
Liner - PVC Membrane	589,050 s.f.	$0.35/s.f.	$ 206,167.50
Bituminous Pavement	692,859 s.f.	$0.55/s.f.	$ 381,072.45
Engineering		Lump Sum	$ 25,000.00
		Subtotal	$1,329,587.95
		10% Contingency	$ 132,958.80
		TOTAL	$1,462,546.75[1]

Note:

1. These quantities and costs are based on present information of site conditions and should be considered approximate.

2. See Appendix H for Site Operation and Long-Term Care Costs.

WARZYN ENGINEERING INC

APPENDIX D

OMC SITE - OPTION 4

WARZYN
ENGINEERING INC

OMC-WAUKEGAN
OMC SITE - OPTION 4
SITE PREPARATION

Item	Quantity	Unit Cost	Cost
Excavation	630,224 c.y.	$1.00/c.y.	$ 630,224.00
Recompacted Clay	284,135 c.y.	$9.00/c.y.	$2,557,215.00
Filter Cloth	248,184 s.f.	$0.11/s.f.	$ 27,300.24
Granular Material	17,888 c.y.	$2.50/c.y.	$ 44,720.00
Liner - PVC Membrane	651,436 s.f.	$0.35/s.f.	$ 228,002.60
Leachate Collection System			
Pipe	3,712 l.f.	$7.50/l.f.	$ 27,840.00
Manhole	($595 + (29.5'-8') $78 + $160) 8[1]		$ 19,456.00
Underdrain System			
Pipe	3,355 l.f.	$7.50/l.f.	$ 25,162.50
Manhole	($595 + (35.5'-8')$78 + $160) 6[1]		$ 17,400.00
Slurry Trench - In-situ Disposal	52,500 s.f.	$3.50/s.f.	$ 183,750.00
Slurry Trench - Dewatering	140,000 s.f.	$3.50/s.f.	$ 490,000.00
On-site Disposal of Excavated Material	636,870 c.y.	$1.50/c.y.	$ 955,305.00
Leachate Collection System In-situ Disposal			
Pipe	840 l.f.	$9.50/l.f.	$ 7,980.00
Manhole	1	$595 + $160[1]	$ 755.00
Drainage Swale	4,100 l.f.	$3.50/l.f.	$ 14,350.00
Relocate Utilities		Lump Sum	$ 50,000.00

WARZYN ENGINEERING INC

OMC-WAUKEGAN
OMC SITE - OPTION 4
SITE PREPARATION
(Cont'd)

Item	Quantity	Unit Cost	Cost
Engineering		Lump Sum	$ 150,000.00
		Subtotal	$5,429,460.34
		10% Contingency	$ 542,946.03
		TOTAL	$5,972,406.37[2]

Notes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

WARZYN
ENGINEERING INC

OMC-WAUKEGAN
OMC SITE - OPTION 4
SITE CLOSURE

Item	Quantity	Unit Cost	Cost
Final Cover			
Parking Lot	77,916 c.y.	$9.00/c.y.	$ 701,244.00
Gas Venting			
Gravel	2,484 tons	$6.00/ton	$ 14,904.00
Vents	6	$200/each	$ 1,200.00
Liner - PVC Membrane	589,050 s.f.	$0.35/s.f.	$ 206,167.00
Bituminous Pavement	692,859 s.f.	$0.55/s.f.	$ 381,072.45
Final Cover In situ Disposal	5,000 c.y.	$9.00/c.y.	$ 45,000.00
Gas Venting In-Situ Disposal			
Gravel	567 tons	$6.00/ton	$ 3,402.00
Vent	2	$200/each	$ 400.00
Liner - PVC Membrane	45,000 s.f.	$0.35/s.f.	$ 15,750.00
Topsoil	833 c.y.	$9.00/c.y.	$ 7,497.00
Seed, Fertilize and Mulch	5,000 s.y.	$0.32/s.y.	$ 1,600.00
Engineering		Lump Sum	$ 25,000.00
		Subtotal	$1,403,236.45
		10% Contingency	$ 140,323.65
		TOTAL	$1,543,560.10[1]

Note:

1. These quantities and costs are based on present information of site conditions and should be considered approximate.

2. See Appendix H for Site Operation and Long-Term Care Costs.

WARZYN ENGINEERING INC

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APPENDIX E

OMC SITE - OPTION 5A and OPTION 5B

WARZYN
ENGINEERING INC

OMC-WAUKEGAN
OMC SITE - OPTION 5A
SITE PREPARATION-(NORTH AREA DISPOSAL)

Costs

Item	Quantity	Unit Cost	Cost
Excavation	233,105 c.y.	$1.00/c.y.	$ 233,105.00
On-site Disposal of Excavated Material	233,105 c.y.	$1.50/c.y.	$ 349,657.50
Recompacted Clay	184,383 c.y.	$9.00/c.y.	$1,659,447.00
Filter Cloth	200,000 s.f.	$0.11/s.f.	$ 22,000.00
Granular Material	12,938 c.y.	$2.50/c.y.	$ 32,345.00
Liner - PVC Membrane	464,657 s.f.	$0.35/s.f.	$ 162,629.95
Leachate Collection System			
Pipe	2,350 l.f.	$7.50/l.f.	$ 17,625.00
Manhole	($595 + (15'- 8')$78 + $160) 6[1]		$ 7,806.00
Underdrain System			
Pipe	1,824 l.f	$7.50/l.f	$ 13,680.00
Manhole	($595 + (26'- 8')$78 + $160) 4[1]		$ 8,636.00
Slurry Trench In-situ Disposal	52,500 s.f.	$3.50/s.f.	$ 183,750.00
Slurry Trench Dewatering	94,500 s.f.	$3.50/s.f.	$ 330,750.00
Leachate Collection In-situ Disposal			
Pipe	840 l.f.	$9.50/l.f.	$ 7,980.00
Manhole	1	$595 + $160[1]	$ 755.00
Drainage Swale	2,500 l.f.	$3.50/l.f.	$ 8,750.00

WARZYN ENGINEERING INC

OMC-WAUKEGAN
OMC SITE - OPTION NO. 5A
SITE PREPARATION-(NORTH AREA DISPOSAL)

(Cont'd)

Costs

Item	Quantity	Unit Cost	Cost
Relocate Utilities		Lump Sum	$ 50,000.00
Engineering		Lump Sum	$ 75,000.00
		Subtotal	$3,163,916.45
		10% Contingency	$ 316,391.65
		TOTAL	$3,480,308.10[2]

Notes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

WARZYN
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OMC-WAUKEGAN
OMC SITE - OPTION 6
SITE CLOSURE - (NORTH AREA DISPOSAL)

Item	Quantity	Unit Cost	Cost
Slurry Trench	189,000 s.f.	$3.50/s.f.	$ 661,500.00
Bituminous Pavement	676,500 s.f.	$0.55/s.f.	$ 372,075.00
Drainage Swale	5,400 l.f.	$3.50/l.f.	$ 18,900.00
Final Cover	75,167 c.y.	$9.00/c.y.	$ 676,503.00
Liner - PVC Membrane	676,500 s.f.	$0.35/s.f.	$ 236,775.00
Relocate Utilities		Lump Sum	$ 50,000.00
Leachate Collection System			
Pipe	5,000 l.f.	$9.50/l.f.	$ 47,500.00
Manhole	($595 + $160) 6[1]		$ 4,530.00
Gas Venting System			
Gravel	2,490 tons	$6.00/ton	$ 14,940.00
Vents	4	$200/each	$ 800.00
Engineering		Lump Sum	$ 30,000.00
		Subtotal	$2,113,523.00
		10% Contingency	$ 213,352.30
		TOTAL	$2,324,875.30[2]

Notes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

3. See Appendix H for Site Operation and Long-Term Care Costs.

WARZYN ENGINEERING INC

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OMC-WAUKEGAN
OMC SITE - OPTION 6
SITE PREPARATION - (HARBOR MATERIAL DISPOSAL)

Item	Quantity	Unit Cost	Cost
General Fill Material	382,580 c.y.	$7.50/c.y.	$2,869,350.00
Clay Liner	309,288 c.y.	$9.00/c.y.	$2,783,592.00
Granular Material	21,074 c.y.	$7.50/c.y.	$ 158,055.00
Filter Cloth	379,320 s.f.	$0.11/s.f.	$ 41,725.20
Liner - PVC Membrane	715,078 s.f.	$0.35/s.f.	$ 250,277.30
Leachate Collection System			
Pipe	4,250 l.f.	$7.50/l.f.	$ 31,875.00
Manhole	($595 + (20'-8')$78 + $160) 12[1]		$ 20,292.00
Underdrain System			
Pipe	3,400 l.f	$7.50/l.f.	$ 25,500.00
Manhole	($595 + (26'- 8')$78 + $160) 8[1]		$ 17,272.00
Drainage Swale	4,476 l.f.	$3.50/l.f.	$ 15,666.00
Topsoil Berms	7,232 c.y.	$9.00/c.y.	$ 65,088.00
Seed, Fertilize, Mulch	43,394 s.y.	$0.32/s.y.	$ 13,886.00
Engineering		Lump Sum	$ 75,000.00
		Subtotal	$6,367,578.50
		10% Contingency	$ 636,757.85
		TOTAL	$7,004,336.35[2]

Notes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

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OMC-WAUKEGAN
OMC SITE - OPTION 6
SITE CLOSURE - (HARBOR MATERIAL DISPOSAL)

Item	Quantity	Unit Cost	Cost
Final Cover	79,359 c.y	$9.00/c.y.	$714,231.00
Topsoil	10,580 c.y.	$9.00/c.y.	$ 95,220.00
Liner - PVC Membrane	599,950 s.f.	$0.35/s.f.	$209,982.50
Gas Venting			
Gravel	107 tons	$6.00/ton	$ 642.00
Vents	6	$200/each	$ 1,200.00
Seed, Fertilize, Mulch	63,487 s.y.	$0.32/s.y.	$ 20,315.84
Engineering		Lump Sum	$ 15,000.00
		Subtotal	$1,056,591.34
		10% Contingency	$ 105,659.13
		TOTAL	$1,162,250.47[1]

Note:

1. These quantities and costs are based on present information of site conditions and should be considered approximate.

2. See Appendix H for Site Operation and Long-Term Care Costs.

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APPENDIX G

OMC SITE - OPTION 7

WARZYN
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OMC-WAUKEGAN
OMC SITE - OPTION 7
SITE PREPARATION

Item	Quantity	Unit Cost	Cost
General Fill Material	434,390 c.y.	$7.50/c.y.	$3,257,925.00
Clay Liner	318,968 c.y.	$9.00/c.y.	$2,870,712.00
Granular Material	21,074 c.y.	$7.50/c.y.	$ 158,055.00
Filter Cloth	379,320 s.f.	$0.11/s.f.	$ 41,725.20
Liner - PVC Membrane	904,274 s.f.	$0.35/s.f.	$ 316,495.90
Leachate Collection System			
Pipe	4,250 l.f.	$7.50/l.f.	$ 31,875.00
Manhole	($595 + (20'-8')$78 + $160) 12[1]		$ 20,292.00
Underdrain System			
Pipe	3,400 l.f	$7.50/l.f.	$ 25,500.00
Manhole	($595 + (26'- 8')$78 + $160) 8[1]		$ 17,272.00
Drainage Swale	4,476 l.f.	$3.50/l.f.	$ 15,666.00
Topsoil Berms	7,667 c.y.	$9.00/c.y.	$ 69,003.00
Seed, Fertilize, Mulch	46,002 s.y.	$0.32/s.y.	$ 14,720.64
Engineering		Lump Sum	$ 150,000.00
		Subtotal	$6,989,241.74
		10% Contingency	$ 698,924.17
		TOTAL	$7,688,165.91[2]

Notes:

1. Manhole Construction Costs
   8' Deep = $595
   Beyond 8' = $78/V.L.F.
   Casting = $160

2. These quantities and costs are based on present information of site conditions and should be considered approximate.

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OMC-WAUKEGAN
OMC SITE - OPTION 7
SITE CLOSURE

Item	Quantity	Unit Cost	Cost
Final Cover	85,716 c.y	$9.00/c.y.	$ 771,444.00
Topsoil	11,429 c.y.	$9.00/c.y.	$ 102,861.00
Liner - PVC Membrane	648,019 s.f.	$0.35/s.f.	$ 226,806.65
Gas Venting			
Gravel	111 tons	$6.00/ton	$ 666.00
Vents	6	$200/each	$ 1,200.00
Seed, Fertilize, Mulch	68,573 s.y.	$0.32/s.y.	$ 21,943.36
Engineering		Lump Sum	$ 20,000.00
		Subtotal	$1,144,921.01
		10% Contingency	$ 114,492.10
		TOTAL	$1,259,413.11[1]

Note:

1. These quantities and costs are based on present information of site conditions and should be considered approximate.

2. See Appendix H for Site Operation and Long-Term Care Costs.

WARZYN ENGINEERING INC

APPENDIX H

OPERATION COSTS AND LONG TERM CARE COSTS

WARZYN
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OMC WAUKEGAN
OPERATION COSTS

Employees		
Manager	$25,000	
Operator	$20,000	$60,000/yr.
Clerical	$15,000	
Equipment		
Dozer	$ 7,000/yr.	
Scraper	$17,000/yr.	$37,000/yr.
Fuel	$ 8,000/yr.	
Main.	$ 5,000/yr.	
Record Keeping/Clerical		
Supplies $2,000		$ 2,000/yr.
Misc. Expenses		$10,000/yr.

Monitoring

6 Wells - $4,000 install

Sampling - $500/trip = $ 7,000

Testing $250/trip $\frac{4 \text{ trip}}{\text{yr.}}$

Leachate Collection & Treatment

$500{,}000 \text{ ft}^2 \times \frac{30''}{\text{yr.}} \times \frac{1'}{12''} \times \frac{7.48 \text{ gal.}}{\text{C.F.}} = 9.36 \times 10^6 \text{ gal./yr.}$

6 months = 4.68×10^6 gal.

4.68×10^6 gal. x $0.05/gal. = $234,000

TOTAL $350,000

Note:

1. The State of Illinois has a $2.02/c.y. of disposed material charge for future funding purposes. At this time no fund of this kind is known to be in affect in Ohio for the CECOS-Williamsburg Site.

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OMC-WAUKEGAN
LONG-TERM CARE (20 YEARS)

Site Inspections 2 inspections/year at $500/inspection for 3 years, 1 inspection/year for following 17 years	$ 12,000
Site Grading $2000/year for 5 years	$ 10,000
Seeding $1,000/year for 10 years	$ 10,000
Water Quality and Gas Monitoring $3,000/year	$ 60,000
Leachate Collection & Treatment PVC Liner 3 gal./yr. x $0.05/gal. = $0.15/yr. (CLay Liner 2.15×10^5 gal/yr. x $0.05/gal. = $10,750 yr.)	Neglectable[1] ($215,000)[2]
Record Keeping $1,000/year for 20 years	$ 20,000
TOTAL	$112,000

Notes:

1. Regardless of the low leachate generation, due to the membrane liner in the final cover, it is assumed that dewatering of the waste following the site closure will be required.

2. If no PVC liner was used in conjunction with the final clay cover, leachate generation would be approximately 2.15×10^5 gal./yr. at a cost of $10,750/yr. or $215,000 for 20 year period.

3. Long-term care costs ($112,000) are based on the maintenance of one disposal site. Where more than one disposal and/or abatement site are considered (Options 5 and 6) at the OMC facility, long-term care costs were estimated at $66,000/site, or a total of $132,000 for the two sites at the OMC facility.

WARZYN ENGINEERING INC

APPENDIX I

COST SUMMARY

WARZYN
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OMC-WAUKEGAN
COST SUMMARY

BFI Site - Option 1A (20' Above/10' Below GND. Surface)

1)	Site Preparation	$1,365,000
2)	Operational Cost	350,000
3)	Site Closure	422,000
4)	Long-Term Care	112,000
	Total	$2,249,000

BFI Site - Option 1B (Below GND. Surface)

1)	Site Preparation	$1,573,000
2)	Operational Cost	350,000
3)	Site Closure	424,000
4)	Long-Term Care	112,000
	Total	$2,459,000

CECOS-Williamsburg - Option 2

1)	Site Preparation	$1,162,000
2)	Operational Cost	350,000
3)	Site Closure	323,000
4)	Long-Term Care	112,000
	Total	$1,947,000

OMC Site - Option 3

1)	Site Preparation	$5,852,000
2)	Operational Cost	350,000
3)	Site Closure	1,463,000
4)	Long-Term Care	112,000
	Total	$7,777,000

OMC Site - Option 4

1)	Site Preparation	$5,973,000
2)	Operational Cost	350,000
3)	Site Closure	1,544,000
4)	Long-Term Care	112,000
	Total	$7,979,000

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Cost Summary Cont'd.

OMC Site - Option 5A

North Area Disposal

1)	Site Preparation	$3,481,000
2)	Operational Cost	130,000
3)	Site Closure	848,000
4)	Long-Term Care	66,000
	Total	$4,525,000

Harbor Dredged Material Disposal

1)	Site Preparation	$5,204,000
2)	Operational Cost	227,000
3)	Site Closure	1,163,000
4)	Long-Term Care	66,000
	Total	$6,660,000

OMC Site - Option 5B

North Area Disposal

1)	Site Preparation	$2,070,000
2)	Operational Cost	130,000
3)	Site Closure	660,000
4)	Long-Term Care	66,000
	Total	$2,926,000

Harbor Dredged Material Disposal

1)	Site Preparation	$5,204,000
2)	Operational Cost	227,000
3)	Site Closure	1,163,000
4)	Long-Term Care	66,000
	Total	$6,660,000

Cost Summary Cont'd.

OMC Site - Option 6

North Area Disposal

1)	Site Preparation	----------
2)	Operational Cost	----------
3)	Site Closure	$2,325,000
4)	Long-Term Care	66,000
	Total	$2,391,000

Harbor Dredged Material Disposal

1)	Site Preparation	$7,005,000
2)	Operational Cost	250,000
3)	Site Closure	1,163,000
4)	Long-Term Care	112,000
	Total	$8,484,000

OMC Site - Option 7

1)	Site Preparation	$7,689,000
2)	Operational Cost	350,000
3)	Site Closure	1,260,000
4)	Long-Term Care	112,000
	Total	$9,411,000

Note:

The above costs have been rounded up to the next thousand.

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