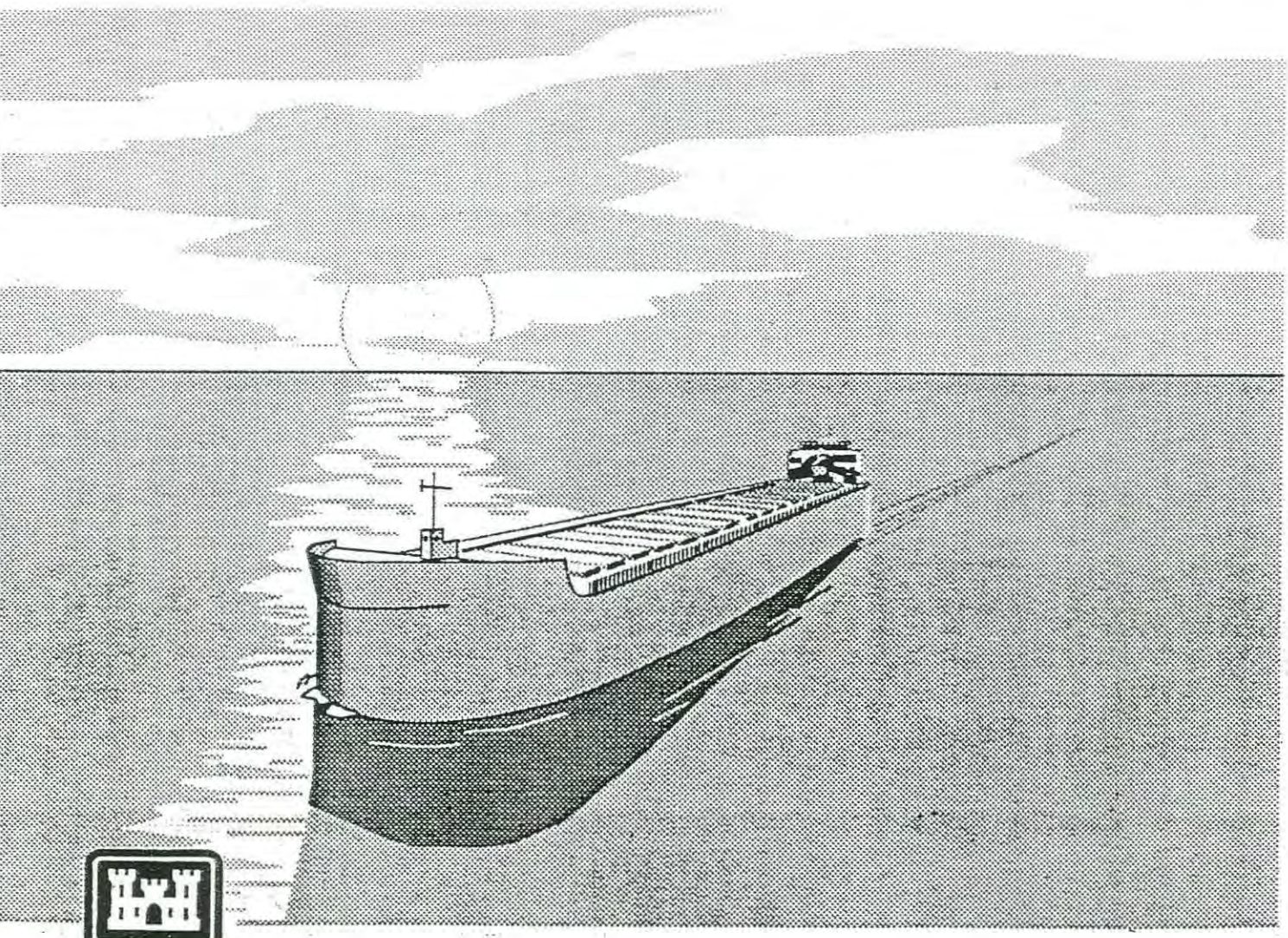
Phase II Report
Final
Dredged Material Management Plan Study
July 2004

Upper Saginaw River, Michigan



US Army Corps of Engineers
Detroit District

EXECUTIVE SUMMARY

The Upper Saginaw River long-term disposal study was initiated in 1979 under the Authority of Section 123, P.L.91-611. Policy and procedures regarding development, review, approval, and implementation of Dredged Material Management Plans (DMMP) were subsequently established in July 1994. To conform to the new policy, this Phase II Final DMMP Document has been prepared and phases the study into the new procedures. This document will identify specific measures necessary to manage the volume of material likely to be dredged over a 20 - year period.

The Upper Saginaw River is located on the west side of Lake Huron, tributary to Saginaw Bay, approximately 90 miles north of Detroit, Michigan. Currently there is no dredged material placement site for the Upper Saginaw River. Future maintenance dredging is required for navigation to regain maximum efficiency in the Saginaw River.

In 2000, the Michigan Department of Environmental Quality (DEQ) and Saginaw County, Michigan was tasked to provide potential upland sites for evaluation. The DEQ submitted three sites within Bay County for evaluation, of which two were determined to be infeasible. Numerous other alternatives have been investigated to date. These range from new upland dredge material placement sites, and beneficial uses of material dredged material for reuse.

Based upon the investigation presented in the Phase II Dredged Material Management Plan document, development of the Zilwaukee Township Site, West of Saginaw River, to a Dredged Material Disposal Facility is the most economically feasible and environmentally sound solution for dredged material placement and is designated the "Base Plan". This Base Plan forms the basis for future actions leading toward implementation of a disposal facility to adequately handle maintenance dredging for a minimum of 20 years for Upper Saginaw River.

Please note that any references in this report regarding elevations refer to International Great Lakes Datum (IGLD), 1955. To convert to IGLD 1985, add 0.7 feet.

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UPPER SAGINAW RIVER, MICHIGAN

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UPPER SAGINAW RIVER, MICHIGAN
DREDGED MATERIAL MANAGEMENT PLAN (DMMP)

1. PROJECT DESCRIPTION

Upper Saginaw River generally runs south to north within the southeast corner of Bay County and empties into the Saginaw Bay of Lake Huron, approximately 90 miles north of Detroit, Michigan (See Figure 1). The Saginaw River channel is a Federally authorized commercial navigation project. The entire channel extends from deep water, 14 miles out in Saginaw Bay of Lake Huron at the north end of the channel, through the mouth of Saginaw River and 22 miles upstream to the city of Saginaw.

The channel limits of the Lower Saginaw River Dredged Material Management Plan (DMMP) study are from a point 14 miles lakeward in Saginaw Bay to 4.7 miles upstream from the entrance of the Saginaw River. The channel limits identified as the Upper Saginaw River DMMP study (See Figure 2) are from a point 4.7 miles upstream from the entrance of the Saginaw River to 22 miles upstream from the entrance of the Saginaw River.

Currently, the dredged material from the Lower Saginaw River (defined above) is placed in the Saginaw Bay Confined Disposal Facility (CDF). Saginaw Bay CDF is located approximately 1.9 miles lakeward from the entrance of the Saginaw River, adjacent to the channel in Saginaw Bay. The dredged material from the Upper Saginaw River has no Dredge Material Disposal Facility (DMDF) identified. An Upper Saginaw River DMDF must be able to contain at a minimum, a 20-year dredged material capacity, which in this case is 3,100,000 cubic yards (cy).

2. SCOPE OF THE STUDY

This study is conducted under the guidance of the National Harbors Program: Dredged Material Management Plan, (EC1165-2-200) policy, dated July 21, 1994. The purpose of this DMMP study is to determine if additional suitable dredged material placement sites are located in the vicinity of Saginaw County that will satisfy future dredge disposal needs of a 20-year capacity associated with the Upper Saginaw River. The decision to recommend implementing the final Management Plan is based upon a preliminary appraisal that at least one potential solution would be engineeringly, economically and environmentally feasible, will be in accord with current Federal policies and budgetary priorities, and will be supported by the project's sponsor, the County of Saginaw.

The purpose of this DMMP document is to: (a) present studies that have been conducted to date; (b) provide an economic assessment to justify continued maintenance dredging; (c) discuss potential options that appear viable for disposal of dredged material; and (d) select a Base Plan for Upper Saginaw River maintenance dredging.

The level of detail in this Phase II DMMP document is limited by the extent of information available in the study time frame. In the Phase II DMMP document phase of the study process, problems and opportunities of the project are defined and potential alternatives are formulated and analyzed to identify a plan (or plans) that would handle the dredging volume for a 20-year period.

3. AUTHORIZATION AND DEVELOPMENT HISTORY

3.1 General

Authorizing legislation for the dredging of the Upper Saginaw River has evolved over the years. Legislation specific to Saginaw River is shown on Table 2.

Prior to 1969, dredged material for the upper and lower Saginaw River was generally open water placed. In 1970 and 1972, the Corps used Skull Island (constructed by the city of Bay City) for the placement of lower and upper Saginaw River dredged material. From 1973 through 1984 the Corps used Middle Ground Island Confined Disposal Facility (CDF) - also constructed by the city of Bay City - for placement of the upper Saginaw River dredged material, while from 1973 through 1977 open water was used for placement of dredged material from the lower Saginaw River.

In 1977 the Saginaw Bay CDF (constructed by the Corps) began accepting dredged material from the lower Saginaw River. Since 1984, Saginaw Bay CDF has been the primary placement site of dredged material from the lower Saginaw River and occasionally from the upper Saginaw River. A study conducted in the mid-1990's determined that it is not cost effective to transport dredged material from the Upper Saginaw River to the Saginaw Bay Island CDF. A summary of disposal locations for annual maintenance dredging is displayed below in Table 1.

TABLE 1 – Disposal History

Year	Upper River	Lower River
Prior-1969	Open Water	Open Water
1970-72	Skull Island	Skull Island
1973-77	Middle Ground Island	Open Water
1977-84	Middle Ground Island	Saginaw Bay CDF
1985-1995	Saginaw Bay CDF[1]	Saginaw Bay CDF
1995-Present	--------	Saginaw Bay CDF

1. The dredged material from Upper Saginaw River was placed in the Saginaw Bay CDF on a emergency basis only, not annually.

Section 123 of the 1970 River and Harbor Act (Public Law 91-611) authorized the Corps of Engineers to construct, operate, and maintain contained placement areas for contaminated dredged material in the Great Lakes area. This law provided for the construction of CDFs

specific to the region, with local interests supplying lands, easements and right-of-ways. Construction of the existing CDF at Saginaw Bay under Section 123 was at 100% Federal cost. A 25% non-Federal cost share was waived in cases that the sponsor was participating in a wastewater treatment program and was not violating water quality standards. However, construction of a new CDF under Section 123 is no longer possible due to a change in policy.

Until passage of the Water Resources Development Act (WRDA) of 1996, there was no specific administrative policy for cost sharing the construction of a new CDF. Administration policy had followed criteria per a 23 July 93 Assistant Secretary of the Army, Civil Works (ASA-CW) memorandum that the Army could accept contributions from non-Federal interests for the pre-1986 projects for all expenses associated with a CDF, unless precluded by authorizing legislation. If a project's authorization was vague regarding responsibility for CDF construction, it was not to be 100% Federal.

A national policy for cost sharing for construction of dredged material disposal facilities associated with the construction and operations and maintenance of Federal navigation projects for harbors and inland waters was established by WRDA '96. It specifies that land-based and aquatic dredged material disposal facilities shall be considered as general navigation features of the project. Section 101 of WRDA '86, as amended by Section 201 of WRDA '96, that pertain to cost sharing for maintenance dredging are as follows;

SEC. 101 HARBORS.
(a) Construction.-

(1) PAYMENTS DURING CONSTRUCTION. - The non-Federal interests for a navigation project for a harbor or inland harbor, or any separable element thereof, on which a contract for physical construction has not been awarded before the date of enactment of this Act shall pay, during the period of construction of the project, the following costs associated with general navigation features:

(A) 10 percent of the cost of construction of the portion of the project which has a depth not in excess of 20 feet; plus

(B) 25 percent of the cost of construction of the portion of the project which has a depth in excess of 20 feet but not in excess of 45 feet; plus

(C) 50 percent of the cost of construction of the portion of the project, which has a depth in excess of 45 feet.

(2) ADDITIONAL 10 PERCENT PAYMENT OVER 30 YEARS. - The non-Federal interests for a project to which paragraph (1) applies shall pay an additional 10 percent of the cost of the general navigation features of the project in cash over a period not to exceed 30 years, at an interest rate determined pursuant to section 106. The value of lands, easements, rights-of-way, and relocations provided under paragraph (3), and the costs of relocations borne

by the non-Federal interests under paragraph (4) shall be credited toward the payment required under this paragraph.

(3) LANDS, EASEMENTS, AND RIGHTS-OF-WAY. -The non-Federal interests for a project to which paragraph (1) applies shall provide the lands, easements, rights-of-way, and relocations (other than utility relocations, under paragraph (4)) necessary for the project including lands, easements, rights-of-way, and relocations (other than utility relocations accomplished under paragraph (4) that are necessary for dredged material disposal facilities.

(4) UTILITY RELOCATIONS. - The non-Federal interests for a project to which paragraph (1) applies shall perform or assure the performance of all relocations of utilities necessary to carry our the project, except that in the case of a project for a deep draft harbor and in the case of a project constructed by non-Federal interests under Section 204, one-half of the cost of each such relocation shall be borne by the owner of the facility being relocated and one-half of the cost of each such relocation shall be borne by the non-Federal interests.

(5) DREDGED MATERIAL DISPOSAL FACILITIES FOR PROJECT CONSTRUCTION. - In this subsection, the term " general navigation features" includes constructed land-based and aquatic dredged material disposal facilities that are necessary for the disposal of dredged material required for project construction and for which a contract for construction has not been awarded on or before the date of enactment of this paragraph.

TABLE 2
AUTHORIZING LEGISLATION

ACT	WORK AUTHORIZED	DOCUMENTS
Jun 25, 1910	Channel 200 feet wide, with depth of 18.5 feet in Bay and 16.5 feet in River.	H. Doc 740, 61st Cong., 2nd Sess.
Jul 3, 1930	Project Depth of 18.5 feet extended up River to Saginaw.	Rivers and Harbors Committee Doc. 30, 71st Cong., 2d Sess.
Aug 26, 1937	Turning Basin.	Rivers and Harbors Committee Doc. 21, 75th Cong., 1st Sess.
Jun 20, 1938	Present project channel dimensions from Bay to Sixth Street Bridge in Saginaw.	H. Doc 576, 75rd Cong., 3rd Sess.
Sep 3, 1954	New Channel in Bay, 350 feet wide and 24 feet deep from 24-foot contour to River mouth, Project Depth of 24 feet in River channel up to Detroit & Mackinac Railway Bridge, Project Depth of 22 feet in River Channel up to Sixth Street Bridge, Turning Basins at Essexville and Carroleton, and elimination of present channel in Bay.	H. Doc. 500, 83th Cong., 2d Sess.
Oct 23, 1962	Deepen Bay Channel, Deepen River Channel to Detroit & Mackinac Bridge, Extend 22-foot project above Sixth Street Bridge, Deepen Essexville Turning Basin, and Construct 2 new Turning Basins.	H. Doc. 554, 87th Cong., 2nd Sess.
Oct 27, 1965	Deepen River Channel to 25 feet, from Detroit & Mackinac, Bridge to New York Central Railroad Bridge.	H. Doc. 240, 89th Cong., 1st Sess.

3.2 Saginaw River

The Saginaw River is located on the west side of Lake Huron approximately 90 miles north of Detroit, Michigan. The River and Harbor Acts of 25 June 1910, 3 July 1930, 26 August 1937, 20 June 1938, 3 September 1954, 23 October 1962, and 27 October 1965 authorized the dredging of the river to accommodate robust commercial shipping activity. Through this dredging history, several sites have been used for dredged material disposal. The following are descriptions of past and currently used disposal sites for this activity.

3.3 Saginaw Bay CDF (Confined Disposal Facility)

The Saginaw Bay CDF was constructed in 1978 under Section 123 of the River and Harbor Act of 1970 (Public Law 91-611). It consists of a 284-acre site with capacity of approximately 10,000,000 cubic yards. As the Bay CDF approached its dredged material capacity in 1995, a DMMP was conducted for the lower Saginaw River. The DMMP, which was approved on May 1997, recommended raising the dikes of the Bay CDF to extend its life for another 20 years. The dikes were raised in 2002 for the northern ½ of the facility only.

It should be noted that the dredged material capacity of the Saginaw Bay CDF was based on the lower Saginaw River only; it was not designed to include dredged material from upper Saginaw River. The DMMP also determined that it is not cost efficient to transport dredged material from the upper Saginaw River to the Saginaw Bay CDF.

3.4 Middle Ground Island

The Middle Ground Island CDF was constructed approximately in 1972 by the city of Bay City. Middle Ground Island is located in the center of the Saginaw River channel, 7 miles upstream of the mouth of Saginaw River (See Figure 2). The CDF site is approximately 12.7 acres and was used as a dredged material transfer site, which supplied material as daily cover for a landfill adjacent to the CDF until the landfill was filled in 1984. The adjacent landfill has been closed, capped and groundwater-monitoring wells installed due to PCB movement in the groundwater. The landfill site is expected to be placed on the superfund list for cleanup.

3.5 Skull Island

The Skull Island CDF disposal site was constructed approximately in 1969 by the city of Bay City. Skull Island is located on the east side of the Saginaw River channel, 8.3 miles upstream of the mouth of Saginaw River, just downstream the Clements Municipal Airport (See Figure 2 – Skull Island not identified on map). The Island is approximately 70 acres, and was raised and connected to the lands on shore via a dump/landfill operation. The Skull Island CDF was filled to capacity with 130,000 cy of material.

3.6 Previous Studies

Upper Saginaw River, Diked Disposal Facility at Crow Island State Game Area, Saginaw and Bay Counties, Michigan, Letter Report and Draft Environmental Impact Statement (November 1984). The study was initiated in 1979. Sixteen sites were evaluated for potential CDF locations under the authority of PL 91-611. The recommended plan was to construct a series of islands located within Crow Island state game area.

Upper Saginaw River, Diked Disposal Facility at Crow Island State Game Area, Saginaw and Bay Counties, Michigan - Supplement I to the Draft Environmental Impact Statement (May 1986). The supplemental report revised the recommended plan location, which continued to be at the Crow Island state game area. However, the revised plan called for constructing one large island instead of a series of small islands. The revisions resulted from opposition by a number of organizations, and difficulties encountered in the design feasibility. The project was dropped in 1986 due to excessively high costs ($8,785,000) and unresolved environmental issues.

Draft Letter Report and Preliminary/Draft Environmental Impact Statement, Diked Disposal Area (Cheboyganing Creek) Upper Saginaw River 1 June 1992. Twenty-nine sites were evaluated for potential Confined Disposal Facility (CDF) locations under the authority of PL 91-611. This study was terminated in November 1999. The basis for the decision to terminate the study was the long-term decline in the level of PCB contamination in the dredged material for the Upper Saginaw River area, and therefore a more stringent confinement facility (CDF) was not required. The cost of constructing the proposed CDF was estimated to be $12,457,000.

4. DESCRIPTION OF EXISTING CONDITION

4.1 General

The channel limits identified as the Upper Saginaw River Dredged Material Management Plan (DMMP) study are from a point 4.7 miles upstream from the entrance of the Saginaw River to 22 miles upstream from the entrance of the Saginaw River. Sediment testing of samples from the Federal Navigation channel occurred in 1999. Based on the sample results, the material is classified as 50% clay and 50% sand. The dredged material, when placed, drains fairly well because of the presence of sand.

The dredged material has low levels of metals and non-detectable levels of PCB's. Dioxins levels average about 200 ppt (toxic equivalents) for the Upper Saginaw River. The material will require a deed restriction.

4.2 Birds

Waterfowl use of the Saginaw Valley area is increasing as a direct result of State and Federal programs in the Saginaw area. Land acquisition and habitat development was initiated in the area in the early 1950's. State and Federal Wildlife areas located immediately south of Saginaw, Michigan and along the bay shore, provide habitat for waterfowl species such as Canada goose, mallard, blue winged teal, black duck, and wood duck. These areas also provide habitat for herring gulls, common terns, marsh hawk and many other bird species.

4.3 Recreation

Area recreation in Saginaw and Bay Counties is provided in the Tobico Marsh State Game Area, Bay City State Park, Quanicassee Wildlife Area, the Crow Island State Game Area and the Shiawassee River State Game Area. Saginaw Bay, a western arm of Lake Huron, is a popular recreational watercraft destination. The channel supports a great opportunity for recreational boating as evidenced by the many marinas along the riverfront.

4.4 Archaeological

Archaeological resources of the Saginaw are significant. The area was used by a number of Great Lakes Indian tribes including the Huron, Ottawa, and diverse Ojibwa Chippewa groups. The first European settlement in the Saginaw Valley occurred around 1816, to engage in fur trading. Many archaeological and historic sites are known to be in the region, particularly along the waterways.

5. PROJECTION OF FUTURE CONDITIONS IN THE ABSENCE OF A MANAGEMENT PLAN

In the absence of a Management Plan, there would continue to be no Dredged Material Disposal Facility (DMDF) available for placement of dredged material. The lack of dredging has resulted in shoal buildup, which reduces channel depth, forcing ships to light load (partially load) or discontinue transit into the upper Saginaw River. Also, shoaled channels cause more sediment resuspension from ship hulls and prop wash. Light loading reduces draft, which allows the vessels to clear the shoals, but increases per-unit shipping costs, which consequently increases costs to industry and the consumer. Appendix C, entitled "Economic Assessment" presents support for continued Operation & Maintenance (O&M) dredging.

6. PROBLEMS AND OPPORTUNITIES

This section summarizes problems (current) and opportunities that were developed during the evaluation for placement of dredged material from the Upper Saginaw River.

6.1 Problems and Current Status

Because of the absence of annual maintenance dredging to keep the river at project depths, ships are forced to light load to transit the river safely. It is anticipated river use by commercial navigation will maintain near present tonnage levels. However, if dredging does not resume, shoaling within the channel will continue, which will force ships to use docking facilities at locations well down stream of their intended destinations, or to seek other ports.

6.2 Opportunities

The opportunity statements presented in this section evolved from evaluating the area resources and problems evident in the development of the Dredged Material Management Plan (DMMP) for Upper Saginaw River:

(a) Locate upland site(s) for future (long-term) consideration to place dredged material;

(b) Evaluate beneficial uses for dredged material.

7. ALTERNATIVE PLANS

The alternatives that are presented in the following paragraphs are those that remain as potential options for consideration in handling future maintenance dredging needs of the Upper Saginaw River navigation channel. The Upper Saginaw River management plan considers a full range of measures, which includes the development of new disposal sites, formulating a beach nourishment program, and beneficial use of the dredged material. A summary of alternative placement options for the annual maintenance-dredging program is displayed at the end of Section 8 in Table 3.

7.1 Alternative 1 - Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility.

This alternative consists of constructing an upland dredged material disposal facility on a large parcel west of the Saginaw River (See figures 3 and 4), approximately 11 miles upstream of the mouth of Saginaw River, west of the city of Bay City, Michigan.

This parcel is approximately 281 acres in size of the 581-acre site. It is located west of Melbourne Road, bordering along Saginaw and Bay counties in Zilwaukee Township, Michigan. This proposed site is presently used as farmland. This site has existing earthen dikes constructed around its perimeter (built prior to 1965). Dredged material would be placed by hydraulic dredging method. There is a Michigan Department of Natural Resources (MDNR) game reserve (Crow Island Game area) located adjacent to the west and south side of the proposed site, and an abandon railroad track lies along its eastern perimeter.

7.2 Alternative 2 - Develop the Buena Vista Township Site, East of Saginaw River, into a Dredged Material Disposal Facility.

This alternative consists of constructing an upland dredged material placement site east of the Saginaw River (See figure 3), approximately 11 miles upstream of the mouth of Saginaw River, in the city of Bay City, Michigan.

This parcel is approximately 131 acres in size of a 274-acre site (see figure 6) and is located east of Bay City Road, southeast of the confluence of Cheboyganing Creek and Saginaw River. This site also lies on the border of Saginaw and Bay counties, but is in Buena Vista Township, Michigan. This proposed site is presently used as farmland. This site has existing earth dikes constructed around its perimeter, which were built prior to 1965. Dredged material would be placed by hydraulic dredging method. There is a Michigan Department of Natural Resources (MDNR) game reserve (Crow Island Game area) located southwest of the proposed site and an active railroad track lies along the western perimeter.

7.3 Alternative 3 – Place Dredged Material at the General Motors Powertrain (Saginaw) Metal Casting Operation Landfill.

This alternative consists of placing dredged material in an existing landfill.

The proposed site is located at Hack Road and Crow Island Road (near M-13), within a ½ mile of Saginaw River, Buena Vista Township, Michigan (See figure 3). This type III landfill was constructed (and has been continuously owned) by the General Motors Corporation, and has been used for placement of foundry lagoon sludge from nearby operations. The landfill is constructed with a clay liner and is outfitted with monitoring wells. Known heavy metals present in the landfill include Zinc, Chrome, Lead and Magnesium. This proposed site has a remaining capacity of approximately 5,000,000 cubic yards.

The shoal material would be mechanically dredged, then transferred to an offloading facility and decanted (dewatered without disturbing the sediments), then transferred by truck to the landfill for a fee. Type III landfills require that any material placed in it must be relatively dry, therefore, the dredged material would need to be decanted at the offloading facility prior to transfer. In 2003, General Motors requested indemnification (through the DEQ) for placement of any dredged material, along with their sand casting material, in the landfill.

7.4 Alternative 4 - Beach Nourishment

Alternative 4 considers the placement of the dredged material on the beaches within Saginaw Bay area shoreline, which would serve a beneficial use.

Beach nourishment is becoming a more utilized option where local conditions warrant. Beach nourishment is ideal in shoreline areas that are classified as “erosional”, where more material is lost through natural erosion than is deposited via littoral drift. Also, beach

nourishment helps to expand recreational beaches at local or state parks, if near by. Lastly, sandy material can be placed on shorelines in preserve areas to enhance shoreline habitat.

7.5 Alternative 5 - Recycle Dredged Material

Alternative 5 considers the hydrocyclone processing of the dredged material, previously placed in an upland DMDF, to provide additional space for future dredged material.

The processed material, which is separated by grain size of gravel, sand and silt, can provide material suitable for beneficial use for agricultural, construction, composting or landfill cover purposes. It would be the responsibility of the local project sponsor to market and sell/use the suitable material for beneficial purposes.

7.6 Alternative 6 - No Action

This alternative recommends that the Federal Government terminate any further participation in the development or construction of a DMDF.

Currently, there is no dredged material disposal facility (DMDF) available for the upper Saginaw River, and there is a dredging backlog of approximately 700,000 cubic yards. If no action is taken to address this problem, it is anticipated that the backlog of shoal material will continue to increase, suspension of maintenance dredging of the Federal navigation channels will persist, and vessels will continue to light load while risking grounding.

8. EVALUATION OF ALTERNATIVE PLANS

8.1 Alternative 1 - Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility.

By constructing a DMDF on 281 acres of the 581-acre site (the County of Saginaw will utilize the remaining 300 acres for wetland mitigation) the needed 3,100,000 CY capacity of containment can be achieved. As such, the site will meet the 20 - year capacity requirement, as mandated in ER 1105-2-100 (Federal Planning Guidance Notebook), Appendix E-15.

The Natural Resource Conservation Service (NRCS) evaluated the original 581 acres of farmland and determined that it is “Prior Converted cropland” and therefore is not considered a wetland. However, the Michigan Department of Environmental Quality (MDEQ) does not agree with NRCS’s position about the classification of the 581 acres. Therefore, the MDEQ requires Saginaw County to provide 300 acres of wetland mitigation if this alternative is executed. Further, this site is easily accessible by hydraulic dredging method. On-site substrate will be used to construct the containment dikes, which will contribute to easier construction and, therefore, reduce construction cost.

As such, this alternative has been determined to be the least costly and engineeringly feasible and therefore is the “recommended alternative”, which will be carried forward for more detailed analysis. Saginaw County has agreed to sponsor the project and is willing to sign a PCA upon approval of the DMMP.

8.2 Alternative 2 - Develop the Buena Vista Township Site, East of Saginaw River, into a Dredged Material Disposal Facility.

This alternative consists of a 274-acre farm site of which the MDEQ also considers as farmed wetland, and therefore would also require wetland mitigation.

As is the case with Alternative 1, the MDEQ would require wetland mitigation at this site. As such, only 131 acres of land could be used for a DMDF; the reduced acreage will not meet requirements for the 20 - year capacity of 3,100,000 CY without constructing much larger perimeter dikes to create a taller facility. The much larger dikes would significantly increase construction costs, which would make the site more costly to develop than Alternative 1. Therefore, Alternative 2 will not be considered further.

8.3 Alternative 3 – Place Dredged Material at the General Motors Powertrain (Saginaw) Metal Casting Operation Landfill.

This Type III landfill has adequate remaining capacity to satisfy the 20-year placement mandate, and is close to the dredging area.

However, the request from General Motors for indemnification for all dredged material placed in the landfill, and their sand casting material (through the MDEQ) was never resolved. Eventually, without the backing of the MDEQ on the issue, General Motors withdrew its site from possible participation in this project. Also, operating expenses would be higher than using a typical CDF, since Type III landfills require that all placed material be considerably dryer than the dredging process normally produces. The triple handling of the dredge material through decanting, then trucking to the landfill, then placing the material (not including the tipping fee) makes this alternative costly. Therefore, Alternative 3 will not be considered further.

8.4 Alternative 4 - Beach Nourishment

This alternative considers the feasibility of using the material to enhance area beaches or return the material into the natural system from which it came.

Sediment analysis from December 1994 determined that the characteristics of the material are classified as "fine grained". Samples were taken at 7 locations in the river channel and 17 in the Bay channel. The fine grain material contains mainly silts and fine sand. The “fine grain” nature of this material makes it physically unsuitable for beach nourishment. In addition, the contaminate nature of the sediment makes it unsuitable for beneficial reuse. As

such, Alternative 4 is not engineeringly feasible or environmentally acceptable and will not be considered as a candidate for implementation.

8.5 Alternative 5 - Recycle the Dredged Material

The Detroit District took part in a demonstration, which was part of the Environmental Protection Agency (EPA) Assessment and Remediation of Contaminated Sediments Program (ARCS) "PILOT-SCALE DEMONSTRATION OF SEDIMENT WASHING FOR THE TREATMENT OF SAGINAW RIVER SEDIMENTS" July 1994 (EPA 905-R94-019). The demonstration was held at the Saginaw Bay CDF beginning in October 1991.

During the demonstration, approximately 300 cubic yards of sediment dredged from Saginaw River was processed through a series of hydrocyclones (and other processing equipment) to separate the sediment into sand and silts. The sediment contaminants are generally associated with the fine-grained particles (silts and clays) and detritus and, upon separation, leave relatively clean sand. If the river sediments were predominantly clay and silt, the economics of the process would be severely affected, as little volume reduction would be achieved.

On the upper Saginaw River, the sand/clay ratio has been estimated at approximately 50/50. The hydrocyclone processing of the material cost $23.17 per c/y in 1991, regardless of composition of the material. In 2004 dollars, the hydrocyclone process would cost approximately $32.17 a c/y, even with considerable sand content. The original $23.17 (and current $32.17 rate) is based on 100,000 c/y; the cost would likely reduce by a percentage with volume (economy of scale), but would still be considerably higher than the current $0.48 per c/y the proposed upland site would cost. The low yield of sand content makes the unit price for processing the dredged material increase significantly. This unit cost does not include dredging and transporting the clean sand for marketing, or storing the fines.

In comparing the cost for Alternative 1 - Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility - at $1,500,000 (as shown in Table 4) which (at 3,100,000 c/y capacity) equates to $0.48 per c/y versus $32.17 per c/y for recycling, it is determined that the recycling alternative is not the least costly alternative and is inefficient. In addition, the contaminated nature of the sediment makes it unsuitable for beneficial reuse.

Lastly, there is an abundance of suitable sandy material available locally for less cost per cubic yard. Therefore this alternative is eliminated from further consideration.

8.6 Alternative 6 - No Action

Unless additional disposal areas are developed, dredging of material from designated navigation channels could not occur which would threaten the viability of the channel as a means to efficiently move goods and commodities. Under the "No Action" option, a backlog

of maintenance dredging would grow, which will limit full utilization of the channel, resulting in increased transportation costs. Therefore, this alternative is not acceptable as a solution.

TABLE 3 - Summary of Alternatives

Alternative	Placement	Capacity cubic yards	Construction Costs ($)	Recommend to Phase II
Zilwaukee Twp. Site	Upland	3,100,000	1,800,000	Y
Buena Vista Twp. Site	Upland	3,100,000	2,200,000	N
General Motors	Upland	5,000,000	-----[2]	N
Beach Nourishment	Upland	Unlimited	------	N
Recycle Dredged Material	Upland	Unknown [1]	------	N
No Action	N/A	N/A	-----	N

1. The dredged material that was determined to be recyclable, yields only 15.86% clean sand.
2. Per discussion with General Motors, tipping fee range $8-$10 per yard equates to $24.8M- 31.0M.

9. TRADE-OFF ANALYSIS

Each of the following alternatives is compared in the following paragraphs as to their advantages and disadvantages if implemented.

9.1 Alternative 1 - Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility.

Advantages: The DMDF location is within a reasonable dredged material haul distance for dredging the Upper Saginaw River. The site is adequate in size to meet the 20 - year capacity, engineering and environmental requirements.

Disadvantages: Temporary disturbance to wildlife habitat during construction.

9.2 Alternative 2 - Develop the Buena Vista Township Site, East of Saginaw River, into a Dredged Material Disposal Facility.

Advantages: The DMDF location is within a reasonable dredged material haul distance for dredging the Upper Saginaw River.

Disadvantages: MDEQ would require wetland mitigation at this site, meaning only 131 acres of land could be used for a DMDF; the reduced acreage will not meet requirements

for the 20 - year capacity of 3,100,000 CY without constructing much larger perimeter dikes to create a taller facility. The much larger dikes would significantly increase construction costs, which would make the site more costly to develop than Alternative 1.

9.3 Alternative 3 – Place Dredged Material at the General Motors Powertrain (Saginaw) Metal Casting Operation Landfill.

Advantages: It has a 5,000,000 cubic yard capacity, which is beyond the 20-year capacity requirement.

Disadvantages: The lack of resolution regarding the indemnification for the dredged material and casting sand. General Motors decided to withdraw its site from further consideration.

9.4 Alternative 4 - Beach Nourishment

Advantages: This alternative could meet the 20 - year capacity.

Disadvantages: The dredged material is not suitable for beach nourishment.

9.5 Alternative 5 - Recycle Dredged Material

Advantages: After the hydrocyclone process, the clean portion of the sediments can be reused.

Disadvantages: This alternative is not the least costly. After the hydrocyclone process, the sediments will yield only approximately 15% clean usable sand and 85% silt that will require containment.

9.6 Alternative 6 - No Action

Advantages: No Federal dollars will be spent.

Disadvantages: The backlog of maintenance dredging would continue to accrue, which will continue to limit full utilization of the channel, resulting in increased transportation costs.

10. SELECTION OF FINAL PLAN

10.1 Base Plan

Original studies to investigate disposal options for dredged material in the Upper Saginaw River were initiated prior to the establishment of DMMP guidelines. This document has been prepared in accordance with recent procedures established for development, review

and implementation of DMMP's. Based on current information in this Phase II DMMP Document, *Alternative 1 - Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility* meets the criteria as engineeringly feasible, environmentally acceptable and least costly. Accordingly, information that follows is presented on the basis that reflects this option as the Base Plan.

Developing the Zilwaukee Township Site, West of Saginaw River, would consist of using 281 acres of the 581-acre site to construct perimeter dikes within the farmland. The remaining 300 acres will be used by Saginaw County for wetland mitigation. New interior dikes will be constructed to supplement the existing dikes (See figure 5, which shows a plan view and typical dike cross section), due to the lack of integrity of the existing dikes. The new dikes will be constructed of clay, which underlies the existing soils, and will be wider at the base and higher in elevation than the existing dikes to incorporate flood plain requirements and to meet the 20-year capacity requirements. The positioning of the offset dike is based on obtaining maximum volume and bearing capacity to support the dike within the DMDF. The entire dike construction may be accomplished in the initial construction.

A weir would be placed at the southern end of the site to address the effluent, which would then be drained back to the Saginaw River. A hydraulic pipeline at the northern end of the site will be used for hydraulic placement of the dredged material.

10.2 Project Advantages

Developing the Zilwaukee Township site, west of Saginaw River was chosen over the other sites because of the following major advantages: it is least costly, while being both engineeringly feasible and environmentally acceptable. Other advantages include that the location is sufficient enough in size to meet the required 20 - year capacity while being situated where a hydraulic pipeline from the river easily accessed. This site is much closer to the dredging operation areas compared to the much greater distance of hauling dredged material to Saginaw Bay Island CDF.

Onsite soil could be used to construct dikes, which contributes to making this alternative less costly than other alternatives.

10.3 Real Estate

The local sponsor (County of Saginaw) has agreed to acquire the necessary real estate interests for the Upper Saginaw River DMDF. The 2004 appraised value of the 281 acres of land required for the DMDF is $726,000. 10 percent of this value could be credited toward Saginaw County's share of the project cost. Fore more detailed analysis, see Appendix D, "Real Estate Plan".

10.4 Project Design

The Design Report (see Appendix A) includes a brief narrative, location map, plan view, cross sections, weir detail, and quantitative calculations for developing the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility.

10.5 Project Construction

The project construction would consist of stripping only the areas within the proposed perimeter dikes of the DMDF. Surface soil would be stockpiled and used as capping material for the filled cells. The rich soil would quickly vegetate, which would provide for a natural appearance to the placement site soon after capping. On-site sub-grade material (clay) would be excavated from the farmland to be used to construct the offset perimeter dikes.

The construction sequence is such that the entire perimeter dike and weir will be constructed at once. A typical construction operation would consist of (a) stripping the topsoil, (b) compacting the surface area immediately under the proposed perimeter dike, (b) excavating and stockpiling the clay for dike construction, (c) shaping and compacting the dikes and, (e) placing dredged material in cells. (See appendix A for details) If a specific dredging operation requires a cordoned off area, then the contractor could use temporary push up berms to isolate such areas.

10.6 Project Cost

The Cost Engineering Appendix shows the costs with contingencies for the project (See Appendix B). The appendix includes a brief narrative, cost summary table, and a detailed cost estimate. Table 4 shows a cost summary for Alternative 1 - Develop the Zilwaukee Township Site, West of Saginaw River. Table 5 shows a cost summary for alternative 2- Developing the Buena Vista Township Site, East of Saginaw River.

Table 4
Cost Estimate for Alternative 1 - Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility. (2004 price level)

	Feature – Capital Costs	Quantity	Unit	Unit Price	Estimated Cost ($)
1	Mob & Demob	1	L.S.	$50,000.00	$ 50,000.00
2	Clearing & Grubbing	8	Acres	$ 2,500.00	$ 20,000.00
3	Stripping Unsuitable Material	145,000	C.Y.	$ 2.25	$ 326,250.00
4	Excavate Clay	191,000	C.Y.	$ 1.45	$ 276,950.00
5	Construct new dike with excavated material	191,000	C.Y.	$ 2.90	$ 553,900.00
6	Install weir	1	Each	$ 5,000.00	$ 5,000.00
7	Security Fencing	15,500	L.F.	$ 14.50	$ 224,750.00
	Subtotal				$ 1,456,850.00
	Feature – Indirect Costs	**Quantity**	**Unit**	**Unit Price**	**Estimated Cost ($)**
8	Engineering/Design (5% of capital costs)	1	Estimate	$57,683.00	$ 57,683.00
9	Construction Management (6%)	1	Estimate	$69,219.00	$ 69,219.00
	Subtotal				$ 126,902.00
	Total Capital (System & Engineering) Costs				$ 1,583,752.00
	Contingency (15%)				$ 237,563.00
	Total Present Worth				$ 1,821,315.00
				Say	$ **1,800,000.00**

Note: See detailed cost estimate provided in Appendix B.

Table 5 Cost Estimate for Alternative 2 - Develop the Buena Vista Township Site, East of Saginaw River, into a Dredged Material Disposal Facility. (2004 price level)					
	Feature – Capital Costs	**Quantity**	**Unit**	**Unit Price**	**Estimated Cost ($)**
1	Mob & Demob	1	L.S.	$50,000.00	$ 50,000.00
2	Clearing & Grubbing	10	Acres	$ 2,500.00	$ 25,000.00
3	Stripping Unsuitable Material	129,000	C.Y.	$ 2.25	$ 290,250.00
4	Excavate Clay	271,000	C.Y.	$ 1.45	$ 392,950.00
5	Construct new dike with excavated material	271,000	C.Y.	$ 2.90	$ 785,900.00
6	Install weir	3	Each	$ 5,000.00	$ 15,000.00
7	Security Fencing	10,080	L.F.	$ 14.50	$ 146,160.00
	Subtotal				$1,705,260.00
	Feature – Indirect Costs	**Quantity**	**Unit**	**Unit Price**	**Estimated Cost ($)**
8	Engineering/Design (5% of capital costs)	1	Estimate	$85,263.00	$ 85,263.00
9	Construction Management (6%)	1	Estimate	$102,316.00	$ 102,316.00
	Subtotal				$ 187,579.00
	Total Capital (System & Engineering) Costs				$ 1,892,839.00
	Contingency (15%)				$ 283,926.00
	Total Present Worth				$ 2,176,765.00
					Say $ **2,200,000.00**
Note: See detailed cost estimate provided in Appendix B.					

11. DESCRIPTION OF SELECTED MANAGEMENT PLAN

11.1 General

The plan is intended to provide a means to manage the dredged material from the Upper Saginaw River for a period of 20 years. The design capacity of the proposed DMDF for the selected site must achieve a 20 - year capacity, be the least costly and engineeringly feasible, while meeting all Federal environmental standards.

11.2 Cost Apportionment

The cost apportionment for developing the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility, is based on cost sharing in accordance with TITLE I of WRDA '96 (see discussion on Page 3, Paragraph 3) which states that, "Dredged Material Disposal Facilities for O&M will now be considered a general navigation feature (GNF) and cost shared in accordance with Title I of WRDA '86. According to WRDA '86, SEC 101 HARBORS, subsection (a)(1) PAYMENTS DURING CONSTRUCTION, the cost to the non-Federal interest is based on the authorized depth of the channel. The channel depth for the upper Saginaw River ranges from 16.5 to 22 feet; therefore it meets the criteria within the 20 to 45 ft range, which has a non-Federal cost share of 25% of the total project cost.

Also, according to WRDA '86, SEC 101 HARBORS, subsection (a)(2) ADDITIONAL 10 PERCENT PAYMENT OVER 30 YEARS, the non-Federal interest shall pay an additional 10 percent of the cost of the general navigation features of the project in cash over a period not to exceed 30 years.

12. ENVIRONMENTAL CONSIDERATIONS

12.1 General

An Environmental Assessment (EA) of the potential impacts of developing the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility, has been prepared pursuant to the National Environmental Policy Act (NEPA). The EA, which is attached to this document, indicates that no significant cumulative or long-term adverse environmental effects would be expected to result from development of the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility.

The EA is available to the public for a 30-day review period. Following this period and a review of the comments received, a final determination will be made by the District Engineer regarding the necessity of preparing an Environmental Impact Statement (EIS) for the proposed development of the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility. Based on the conclusions of the EA, it appears that preparation of an EIS will not required and the NEPA process culminate in the signing of a Finding of No Significant Impact (FONSI).

13. RESULTS OF COORDINATION WITH LOCAL, STATE AND FEDERAL AGENCIES

Some of the correspondence listed below is included in Appendix E – "Correspondence". Please refer to the individual correspondence for more detail in regard to certain communications.

On, November 12, 1999, the Corps notified the Michigan Department of Environmental Quality (DEQ) by letter, that the Corps has terminated the study for a Confined Disposal Facility (CDF) for the Upper Saginaw River under the authority Section 123, Public Law 91-

611. On June 21, 2000, the Department of Environmental Quality (Russell J. Harding) requested the Corps, by letter, to initiate this DMMP study.

On July 13, 2000, the Corps provided the Michigan Department of Environmental Quality (MDEQ) by letter, with a set of criteria, which the MDEQ could use to aid them in their search for potential upland unconfined dredged material disposal sites. The MDEQ and Saginaw County coordinated with the Corps to find potential upland disposal sites for evaluation. The MDEQ submitted three potential upland sites for evaluation in 2000.

On January 22, 2002 the County of Saginaw, Board of Commissioners passed RESOLUTION C, "Saginaw County Identified as Local Sponsor for Upper Saginaw River Dredging Project"

On October 15, 2002 the County of Saginaw, Board of Commissioners passed RESOLUTION D, "Reaffirming Support of Saginaw River Dredging Project"

On August 12, 2003, Saginaw County and the Corps held a public meeting at Saginaw Valley State University with representatives from the Michigan Department of Natural Resources (MDNR), the U.S. Fish & Wildlife Service (F&WS) and Zilwaukee Township. In the meeting the various alternatives (upland disposal and recycling dredged material) were discussed.

During the preparation of the Environmental Assessment, there was coordination efforts between the COE and the Michigan Department of Natural Resources (MNDR), Environmental Protection Agency (EPA), Fish & Wildlife Service (F&WS) and State Historical Preservation Office (SHPO). Comments from this coordination effort are discussed in the Environmental Assessment.

Coordination with the Michigan Lieutenant Governors Office, Saginaw County and the Michigan Department of Environmental Quality has been positive throughout the project. The Lieutenant Governor's Office became actively involved in the project in 2003 through the Saginaw County Commissioner, who invited the lieutenant Governor to a project update meeting. The Lieutenant Governor vowed to be an active participant in seeing the project through to completion.

14. COST SHARING AND FINANCING

14.1 Management Plan Studies

The cost associated with Management Plan studies for continued maintenance of existing Federal navigation projects are O&M costs and shall be 100% Federally funded. Project sponsors, port authorities, and other project users, are partners in dredged material management and must pay the costs of their own participation in the dredged material

management studies including participation in meetings, providing information and other coordination activities.

Budgeting priorities for the navigation purpose is limited to the Base Plan. Therefore, the cost for any component of a management plan study attributable to meeting local or state requirements of Federal laws and regulations shall be a non-Federal cost. The COE does not anticipate any additional costs will be incurred beyond those associated with the execution of the base plan related to compliance with any required local or state laws and regulations. Study activities related to dredged material management for the Federal project but not required for continued maintenance dredging and dredged material disposal, will not be funded by the Federal Government and will not be included in the dredged material management studies unless funded by others.

Studies of project modifications needing congressional authorization, including dredged material management requirements related to the modification, will be pursued as cost shared feasibility studies with General Investigations funding. Where the need for such modifications are identified as part of dredged material management studies, O&M funding for the study of the modification should be terminated and a new feasibility study start sought through the budget process under the authority of Section 216 of the Water Resources Development Act (WRDA) of 1970.

The costs of studies associated with beneficial uses that are consistent with, and part of, the Base Plan are Federal O&M costs. However, study costs for beneficial uses which are not part of the Base Plan, beyond those reconnaissance level studies needed to identify these potential uses as part of management plan studies, are either a non-Federal responsibility or are a shared Federal and non-Federal responsibility, depending on the type of beneficial use.

The incremental costs of studies beyond those required for the Base Plan for the use of dredged material to restore and protect environmental resources, pursuant to Section 1135 of the 1986 WRDA, as amended, and/or Section 204 of the 1992 WRDA, are not navigation O&M. If a potential restoration project exceeds the cost limitations of Section 1135 or Section 204, it may be pursued as a cost shared feasibility study leading to specific authorizations. The non-Federal incremental cost for these authorities is 25%. Section 1135 is an authority that provides for project modification in the interest of fish and wildlife habitat restoration. Section 204 is an authority that allows for protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands, using dredged material from Corps navigation projects.

14.2 Implementation

Costs for implementing Management Plans for existing projects are O&M costs and shall be shared in accordance with navigation O&M cost sharing provisions applicable to the project as authorized. The cost for any component of a Management Plan attributable solely to

15. CONCLUSION/RECOMMENDATION

The Upper Saginaw River is in need of a dredged material disposal facility; all maintenance dredging of the upper river has ceased, and will remain so until a suitable disposal site is located and constructed. Unless new disposal areas are developed, deep draft navigation channels will continue to shoal, which would threaten the viability of the channel as a means to efficiently move goods and commodities.

Accordingly, it is recommended that the Detroit District proceed with detailed design and plans and specifications for the Base Plan presented in the Phase II Final Dredged Material Management Plan document to provide management of dredged material for a 20-year period for Upper Saginaw River.

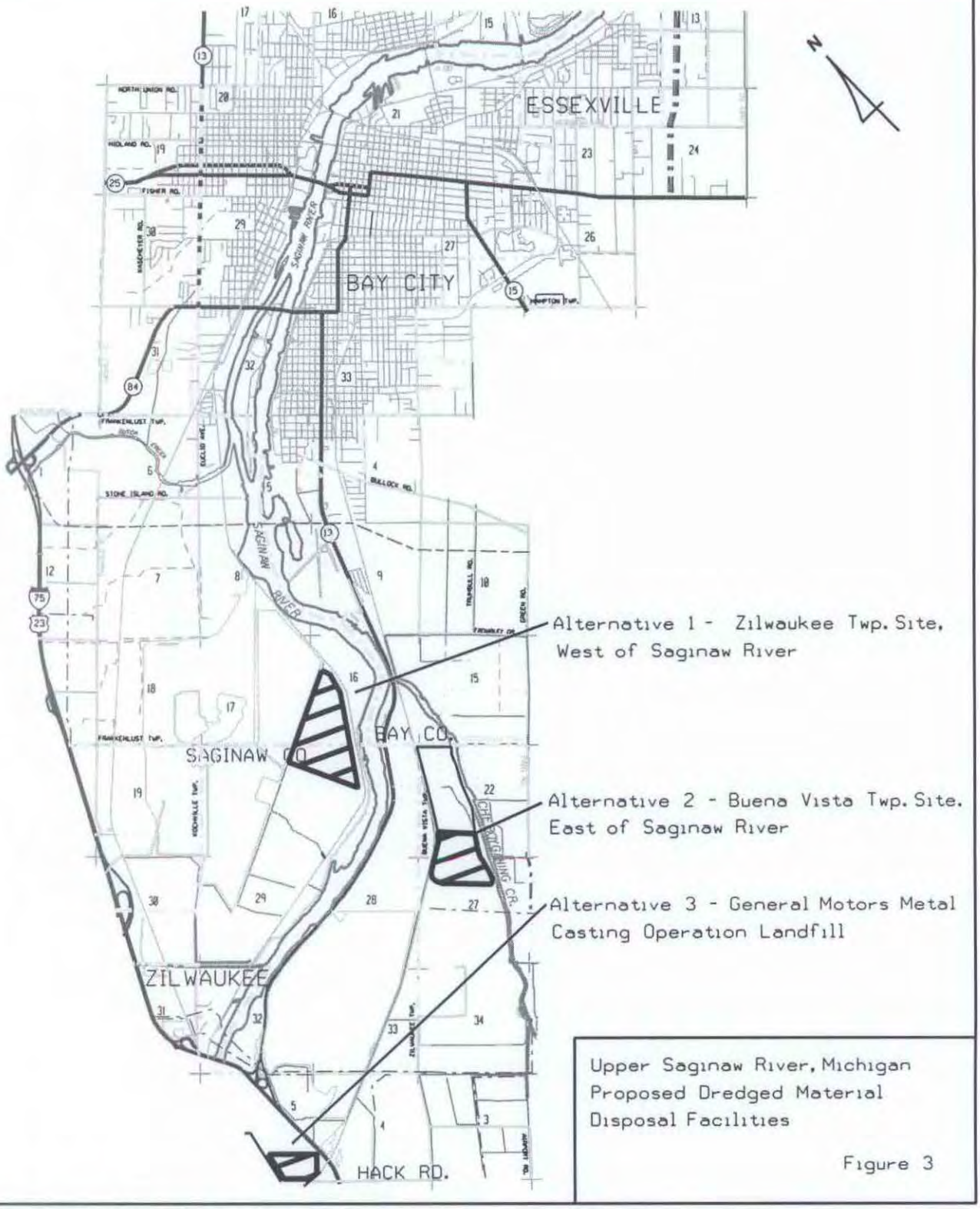
DONALD P. LAUZON
LTC, EN
Commanding

Figure 1

Regional map showing the relative location of the Upper Saginaw River project site.


SAGINAW RIVER
upper
lower
CORPS OF ENGINEERS
U.S. ARMY
37
SAGINAW
BAY
CITY
BANGOR
TOWNSHIP
ESSEXVILLE
SAGINAW
SAGINAW RIVER
MICHIGAN
Scale of Feet
U. S. ARMY ENGINEER DISTRICT, DETROIT
SEPTEMBER 30, 1960
SIXTH STREET TURNING BASIN
CARROLLTON TURNING BASIN
AIRPORT TURNING BASIN
ESSEXVILLE TURNING BASIN
DIKED DISPOSAL FACILITY
INSET MAP 'A'
INSET MAP 'B'
LEGEND
INDEX TO BRIDGES
PROJECT DEPTH 20.0 FT.
PROJECT DEPTH 22 FT.
PROJECT DEPTH 25 FT.
PROJECT DEPTH 26 FT.
PROJECT DEPTH 27 FT.
TURNING BASIN PROJECT DEPTH 15 FT.
SIXTH ST. TURNING BASIN PROJECT DEPTH 20 FT.
AIRPORT TURNING BASIN PROJECT DEPTH 22 FT.
PROJECT DEPTH 16.5 FT.
PROJECT DEPTH 22 FT.
PROJECT DEPTH 26 FT.
CARROLLTON TURNING BASIN PROJECT DEPTH 20 FT.
Upstream Limit of Federal Improvement
Outer Limit of Federal Improvement
Tittabawassee River
Green Point
Shiawassee River
THIS SECTION NOT MAINTAINED
ZILWAUKEE
CARROLLTON
C. & O. PROPERTY
U.S. GOVERNMENT PRINTING OFFICE 1985-544-214

Figure 2



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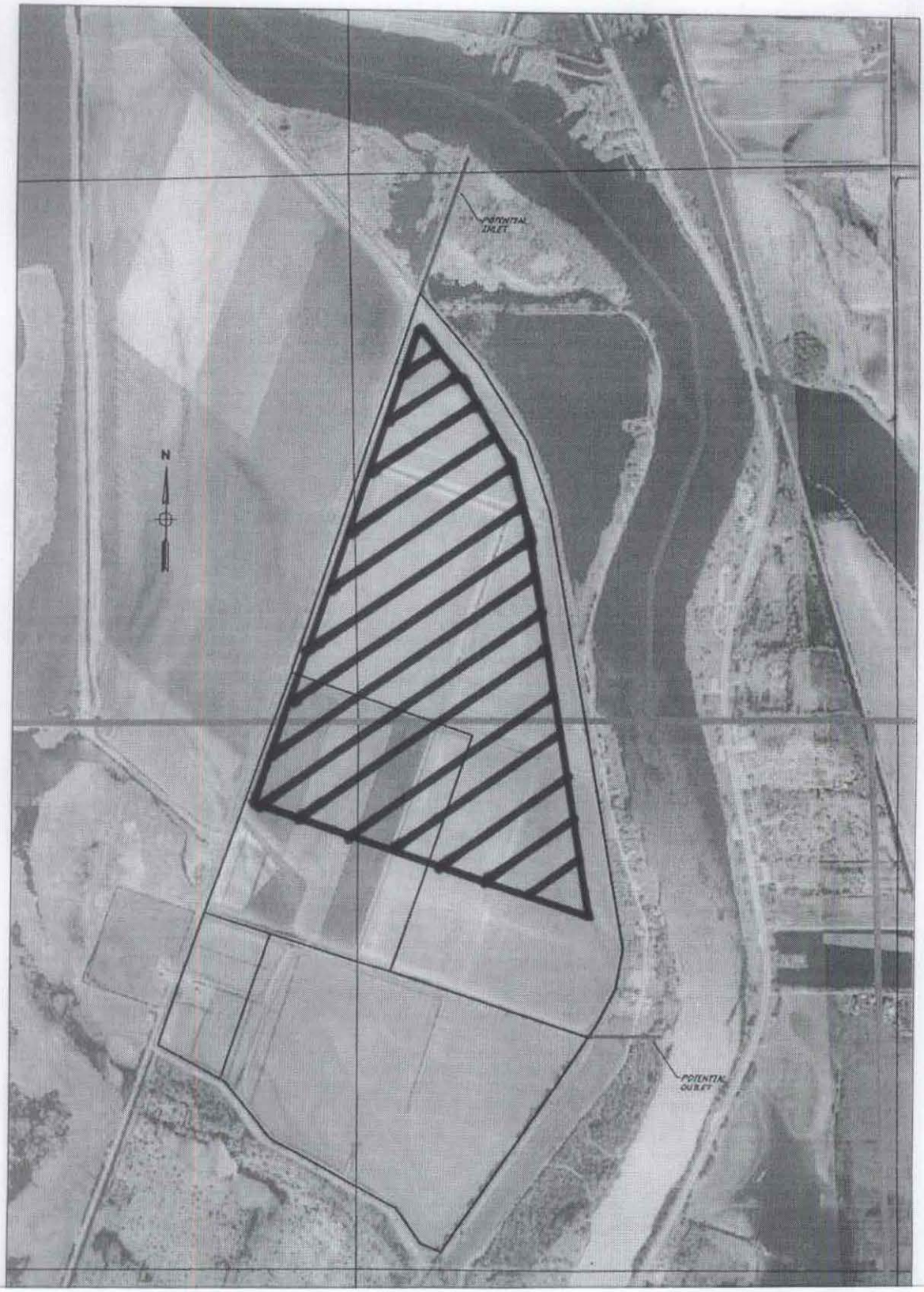
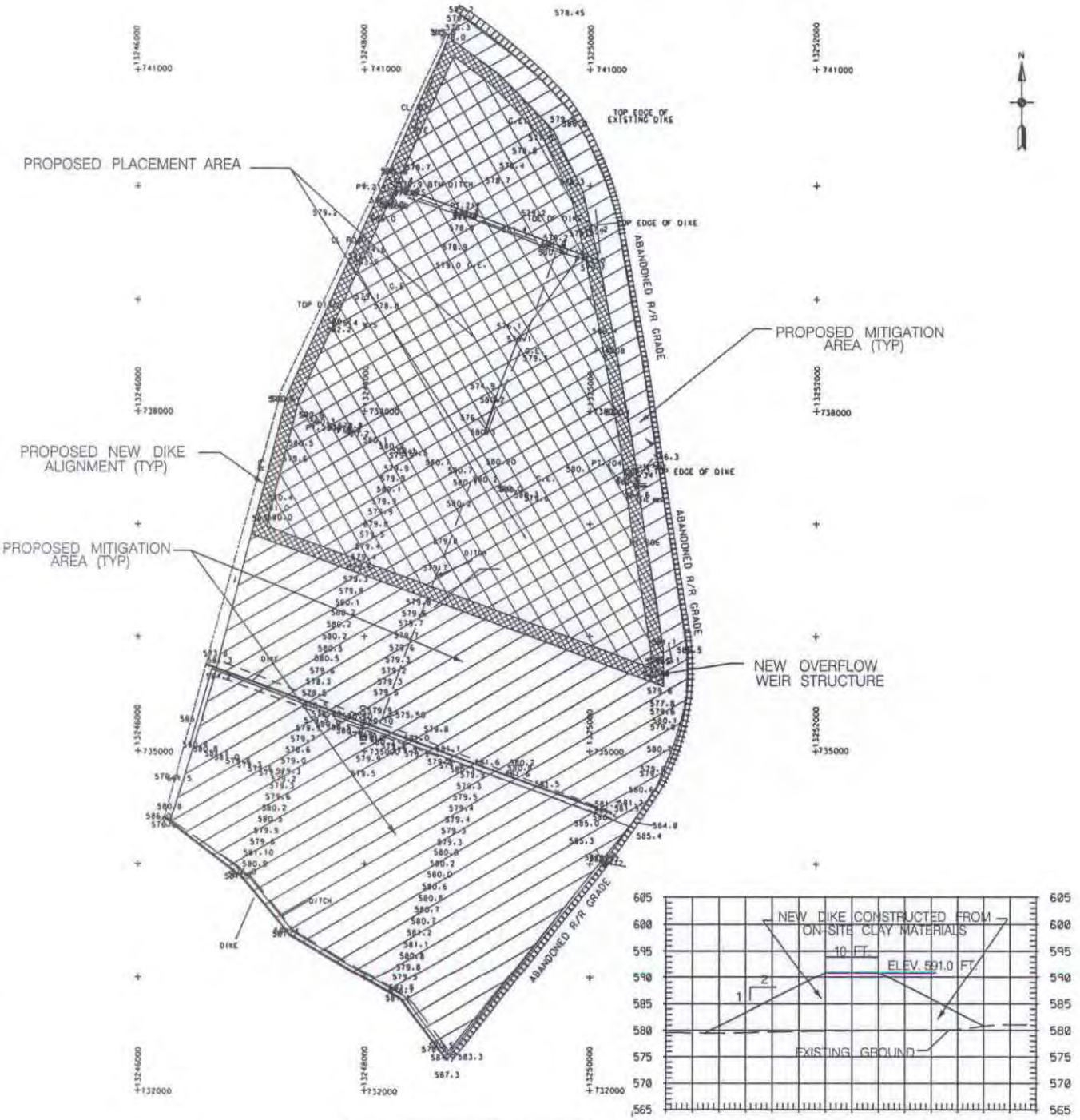


Figure 4 – Aerial photograph of the proposed placement site for Alternative 1 – "Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility". The hatched area represents the 281 acres that will be used to place the dredged material from the Saginaw River, which is just to the right (east) of the proposed site.



SITE PLAN

500 250 0 500 1000FT

SCALE: 1" = 500'

TYPICAL DIKE SECTION

NOTES:

1. THE TOTAL AREA OF THE SITE IS APPROXIMATELY 581 ACRES.
2. THE AREA OF THE PROPOSED (HACHURED) PLACEMENT AREA IS APPROXIMATELY 281 ACRES.
3. THE AREA OF THE PROPOSED MITIGATION AREA IS APPROXIMATELY 300 ACRES.

U.S. ARMY ENGINEER DISTRICT, DETROIT
CORPS OF ENGINEERS
DETROIT, MICHIGAN

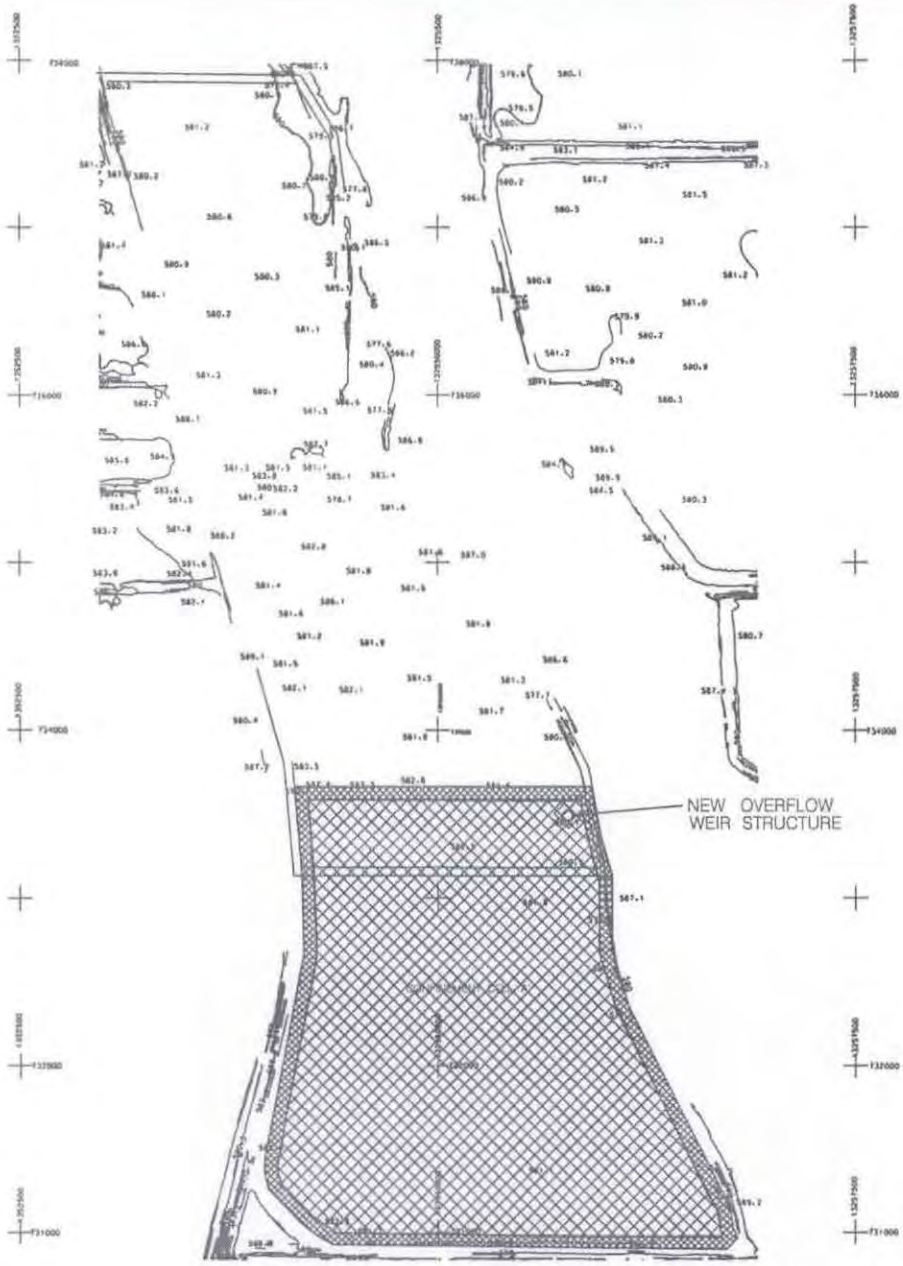
UPPER SAGINAW RIVER, MICHIGAN

PROPOSED DREDGED MATERIAL PLACEMENT SITE (WEST)

SITE PLAN

DRAWN BY: PJO	CHECKED BY: KJW
DATE: 10 MAY 2004	FIGURE 5

...\uppersag\fig5west.dgn 07/07/2004 08:06:48 AM



SITE PLAN

250 0 500 1000FT

SCALE: 1" = 500'

NOTES:

1. THE TOTAL AREA OF THE SITE IS APPROXIMATELY 274 ACRES.
2. THE AREA OF THE PROPOSED (HACHURED) PLACEMENT AREA IS APPROXIMATELY 131 ACRES.
3. THE AREA OF THE PROPOSED MITIGATION AREA IS APPROXIMATELY 143 ACRES.

U.S. ARMY ENGINEER DISTRICT, DETROIT
CORPS OF ENGINEERS
DETROIT, MICHIGAN

UPPER SAGINAW RIVER, MICHIGAN

PROPOSED DREDGED MATERIAL PLACEMENT SITE (EAST)

SITE PLAN

DRAWN BY: PJO	CHECKED BY: KJW
DATE: 10 MAY 2004	FIGURE 6

...\uppersag\fig6east.dgn 07/07/2004 08:07:33 AM

APPENDIX A

DESIGN REPORT
(Technical Appendix)

FOR THE

PHASE II, REPORT
DREDGED MATERIAL MANAGEMENT PLAN
UPPER SAGINAW RIVER, MICHIGAN

UPPER SAGINAW RIVER, MICHIGAN
DREDGED MATERIAL MANAGEMENT PLAN (DMMP)

TECHNICAL APPENDIX (A)

U.S. ARMY CORPS OF ENGINEERS
DETROIT DISTRICT
JULY 2004

UPPER SAGINAW RIVER, MICHIGAN
DREDGED MATERIAL MANAGEMENT PLAN (DMMP)
TECHNICAL APPENDIX (A)

TABLE OF CONTENTS

UPPER SAGINAW RIVER, MICHIGAN
DREDGED MATERIAL MANAGEMENT PLAN (DMMP)
TECHNICAL APPENDIX (A)

INTRODUCTION

A. PURPOSE AND SCOPE OF STUDY. The purpose of this appendix is to present detailed engineering and design data for the Upper Saginaw River, Michigan Dredged Material Placement Site (DMPS) project. This appendix provides the basis for the preparation of plans and specifications for construction of the DMPS. Description of procedures and basic supporting data related to investigations made in connection with the preparation of this appendix are presented in the paragraphs and figures to follow. This engineering and design is being accomplished under the National Harbors Program: Dredged Materials Management Plan (DMMP).

B. BACKGROUND. Since the latter part of the 1970's, materials from the upper reaches of the Saginaw River were placed in the Middleground Island Confined Disposal Area and those from the lower river were placed in the Saginaw Bay Confined Disposal Area. The Middleground Island Facility was filled and returned to the local sponsor in 1984. Dredging in the Upper River was reduced with only the critical shoals being removed and placed in the Bay CDF at additional expense due to the greater haul distance.

Two sites have been identified for analysis in this appendix. One alternative site for placement of dredged materials has been identified at a location in Buena Vista/ Zilwaukee Township, west of the Saginaw River, approximately 11 miles upstream of the mouth of Saginaw River, in the city of Bay City, Michigan. See Figure 1 for the project location and vicinity maps. The site which lies adjacent to and west of the Saginaw River encompasses a total area of approximately 581 acres. The second alternative site for placement of dredged materials has been identified at a location in Buena Vista/ Zilwaukee Township, approximately 11 miles upstream of the mouth of Saginaw River, in the city of Bay City, Michigan. The site which lies adjacent to and east of the Saginaw River encompasses a total area of approximately 274 acres.

C. DATA COLLECTION. The design data collected during the course of this study has included the following:

1. CADD drawings developed from topographic surveys provided by the Technical Support Section, Detroit District Corps of Engineers used for the plan layout and volume computations.

2. Soil boring investigations by STS Consultants in July 2002 used to develop a representative soil profile of the area and provide data for a stability analysis of the existing dikes and proposed dikes.

3. A list of pertinent references is provided on Page 5 of this document.

DESIGN

A. DESIGN CRITERIA. The design rationale used in this study provides for an efficient least cost plan based on sound engineering practice with proper consideration given to environmental and social aspects. The following parameters were assumed:

- Total Available Capacity of the DMPS is approximately 3,100,000 cubic yards. It is assumed that bulking and consolidation will be the same.

- Confinement dikes would be constructed from on-site clay materials.

- The large area available for containment will permit storage of a high volume of dredged material sediments and transport water without discharge thereby allowing for maximum settling time of the sediments without the need to construct high confinement dikes.

- Dredging may be performed by both mechanical and hydraulic equipment, however it will be assumed that conveyance into the site will be by hydraulic methods.

B. PROJECT FEATURES. The Saginaw River Dredged Material Placement (West) Site (DMPS) is located in Zilwaukee Township, Michigan adjacent to and west of the Saginaw River. The Site Plan is shown on Figure 1. An alternative site evaluated during this study, the Buena Vista Township (East) Site is located east of the Saginaw River approximately 11 miles upstream from the mouth of the Saginaw River. The Site Plan is shown on Figure 3. The total area available for utilization of construction of new dikes for dredged material placement is approximately 281 acres for the west site and 120 acres for the east site. The current plan is to construct one confinement cell within each site. The volume of materials to be dredged and placed during a particular dredging season will depend upon the degree of critical shoaling and the availability of dredging funds, however, it is estimated that average annual maintenance dredging activities would be 150,000 cubic yards per year. Although portions of the east site and the west site are diked, project mitigation and site selection features dictate that higher dikes with engineering materials be constructed in order to permit disposal by hydraulic methods.

Materials for new dike construction would be obtained from borrow areas located within each site. It is anticipated that the borrow areas would be located along the new dike location and excavation would continue along the length of dike. Prior to excavation of materials for new dike construction, a one foot (1.0 ft.) layer of topsoil will be stripped from the proposed borrow area

within the confines of the proposed dikes, and either stockpiled or removed from the project area. Any excess excavated material may also be stockpiled or hauled away by the contractor. A chain-link type security fence (Figure 8) will be constructed around the outer perimeter of the placement area.

All confinement dikes will have an minimum ten foot (10.0 ft.) top width and side slopes of 1V:2H. Hydraulically dredged material will be placed into the confinement cell by contractor furnished pipeline. The pipeline will enter the placement area from the river side of the site. Discharge into the confined area would be controlled so as to preclude erosion of the interior dike slopes. A stop-log type weir will be used to control the flow of water discharged from the confinement cell. The discharge will then flow from the weir through a 12 "diameter CMP that will be buried along an easement from the confinement area to the Saginaw River. During the latter years of use of a confinement cell, interior spur dikes can be constructed so as to provide the greatest length of flow within the cell and subsequently the greatest amount of settling time.

C. SITE DESIGN. The Zilwaukee Township (West) is the selected site for this study. The design of the site is simplified by the relatively large area available for confinement. The containment cell will be designed to provide storage for dredged material sediments and associated transport water during the initial dredging season and subsequent dredging cycles. This will allow for maximum settling of the solids to take place and release of the clarified water after a period of time.

In the initial dredging and disposal cycle, assuming 150,000 cubic yards of materials are removed, the total volume of transport water and solids that are to be confined is estimated to be 750,000 cubic yards. This is based on past project experience in the Upper Saginaw River that hydraulically pumped dredged materials which are primarily silty sands and would contain approximately 20% solids and 80% water. Based on these parameters, a minimum dike height of 11.0 ft. including 2.0 ft. of freeboard is required for the west site, and a minimum dike height of 17.0 ft. including 2.0 ft. of freeboard is required for the east site The depth of the remaining sediments after dewatering is estimated to average 0.5 ft. per dredging cycle.

The average ground elevation within the interior areas of the sites is 580.0 ft for the west site, and is 582.0 ft for the east site. New dikes for each site would be constructed of clay materials borrowed from on-site. This clay material would be compacted to ensure insure dike integrity and impermeability. A typical cross section is shown on Figures 4.

The outlet structures would be stop log type weirs for both the east and the west sites. The use of the stop log weir allows operators to manually adjust the water level in the placement area according to the incoming flow conditions. In order to meet water quality requirements for effluent that is discharged from the site, the stop logs would be set in such a manner as to stop any flow out from the site thereby allowing the maximum amount of detention and settling time for solids. Design of the weirs is based on structures that have been constructed and operated at various disposal

facilities throughout the Detroit District. The relatively simple design results in efficient fabrication and ease of operation. As noted before, control of water flow and subsequently water levels within an impounded area is afforded by this type of structure. This is necessary due to the importance placed on achieving a specific level of water quality of the effluent that leaves the site and re-enters the waterway.

As previously mentioned in this Appendix, spur dikes could be constructed within the confinement area. The spur dikes would consist of existing dredged sediments and located such that the flow distance from the point of discharge into the site to point of discharge at the weir structure is effectively increased upwards to a factor of two thereby increasing the detention times of the dredged sediments. This will be necessary during the latter periods of operation when the available volume of storage capacity of the site is reduced.

A stability analysis of the proposed new dike configuration for the west site was undertaken in order to assure its integrity under various hydraulic conditions. A stability analysis was not completed for the east site. Data for the analyses was derived from soil borings taken within the proposed placement area as shown on Figure 6. The borings indicate that the surficial geology of the interior of the site is composed of topsoil that consists of sand with varying amounts of silt, sand and gravel with trace roots. The existing access roads and dike systems consist of either a sand and gravel or clay fill. The sand and gravel fill consists of brown medium to coarse sand and generally extends to a depth of 2.0 feet below the topsoil. The clay fill is a brown to gray containing varying amounts of silt, sand and gravel with a very stiff to hard consistency and generally extends to a depth of 2.0 to 8.0 feet. The natural soils at the site consist of a brown medium to stiff silty clay. This clay was brown to gray with varying amounts of silt, sand and fine gravel and generally extend to the termination point of the soil borings at a depth of 25 to 40 feet. A soil profile of the placement area is shown on Figure 7. The Stability Analysis is contained on Pages A17 thru A 30.

REFERENCES

1. U.S. Army, Waterways Experiment Station. January 1976. Mathematical Model for Predicting the Consolidation of Dredged Material in Confined Disposal Areas. Technical Report DS-76-1. Vicksburg, Mississippi.

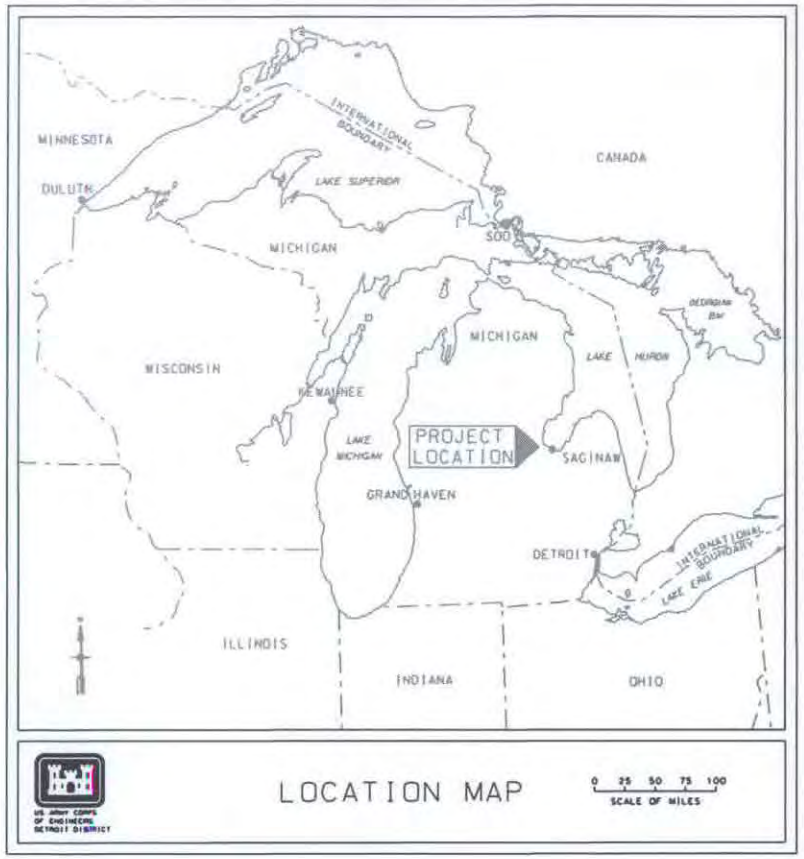
2. U.S Army Engineer District, Savannah. November 1977. Design and Construction of Retaining Dikes for Dredged Material Containment Facilities. Technical Report DS-77-9. Savannah, Georgia.

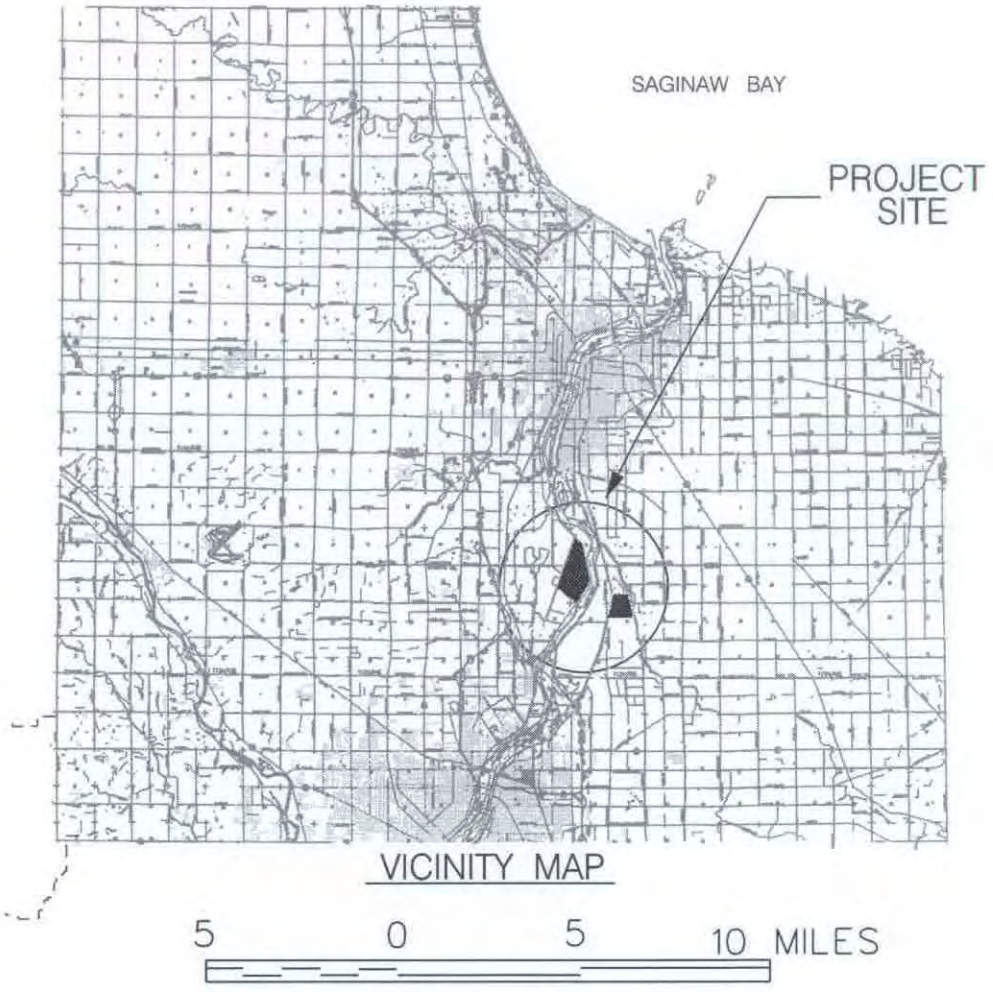
3. U.S. Army, Waterways Experiment Station. December 1978. Guidelines for Designing, Operating and Managing Dredged Material Containment Areas. Technical Report DS-78-10. Vicksburg, Mississippi.

4. U.S. Army, Office, Chief, of Engineers. April 1970. Stability of Earth and Rock Filled Dams. EM 1110-2-1902. Washington, D.C.

5. U.S. Army, Office, Chief of Engineers. March 1978. Design and Construction of Levees. EM 1110-2-1913. Washington, D.C.

FIGURES





A-1

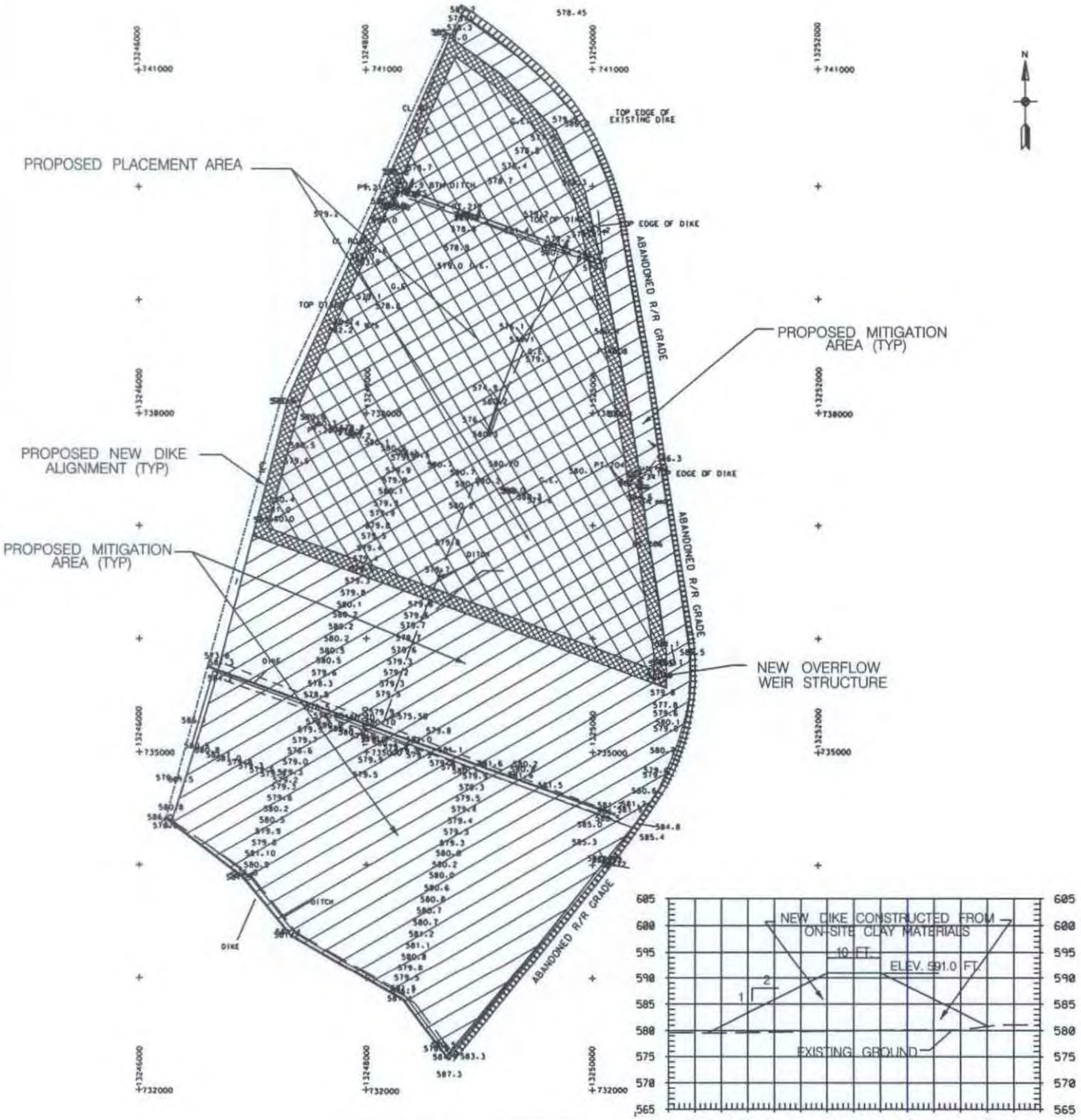
U.S. ARMY ENGINEER DISTRICT, DETROIT
CORPS OF ENGINEERS
DETROIT, MICHIGAN

UPPER SAGINAW RIVER, MICHIGAN

DREDGED MATERIAL MANAGEMENT PROGRAM

LOCATION AND VICINITY MAPS

DRAWN BY: PJO	CHECKED BY: KJW
DATE: 10 MAY 04	FIGURE 1



SITE PLAN

500 250 0 500 1000FT

SCALE: 1"= 500'

TYPICAL DIKE SECTION

NOTES:

1. THE TOTAL AREA OF THE SITE IS APPROXIMATELY 581 ACRES.
2. THE AREA OF THE PROPOSED (HACHURED) PLACEMENT AREA IS APPROXIMATELY 281 ACRES.
3. THE AREA OF THE PROPOSED MITIGATION AREA IS APPROXIMATELY 300 ACRES.

U.S. ARMY ENGINEER DISTRICT, DETROIT
CORPS OF ENGINEERS
DETROIT, MICHIGAN

UPPER SAGINAW RIVER, MICHIGAN

PROPOSED DREDGED MATERIAL PLACEMENT SITE (WEST)

SITE PLAN

DRAWN BY:	CHECKED BY:
PJO	KJW
DATE: 10 MAY 2004	FIGURE 2

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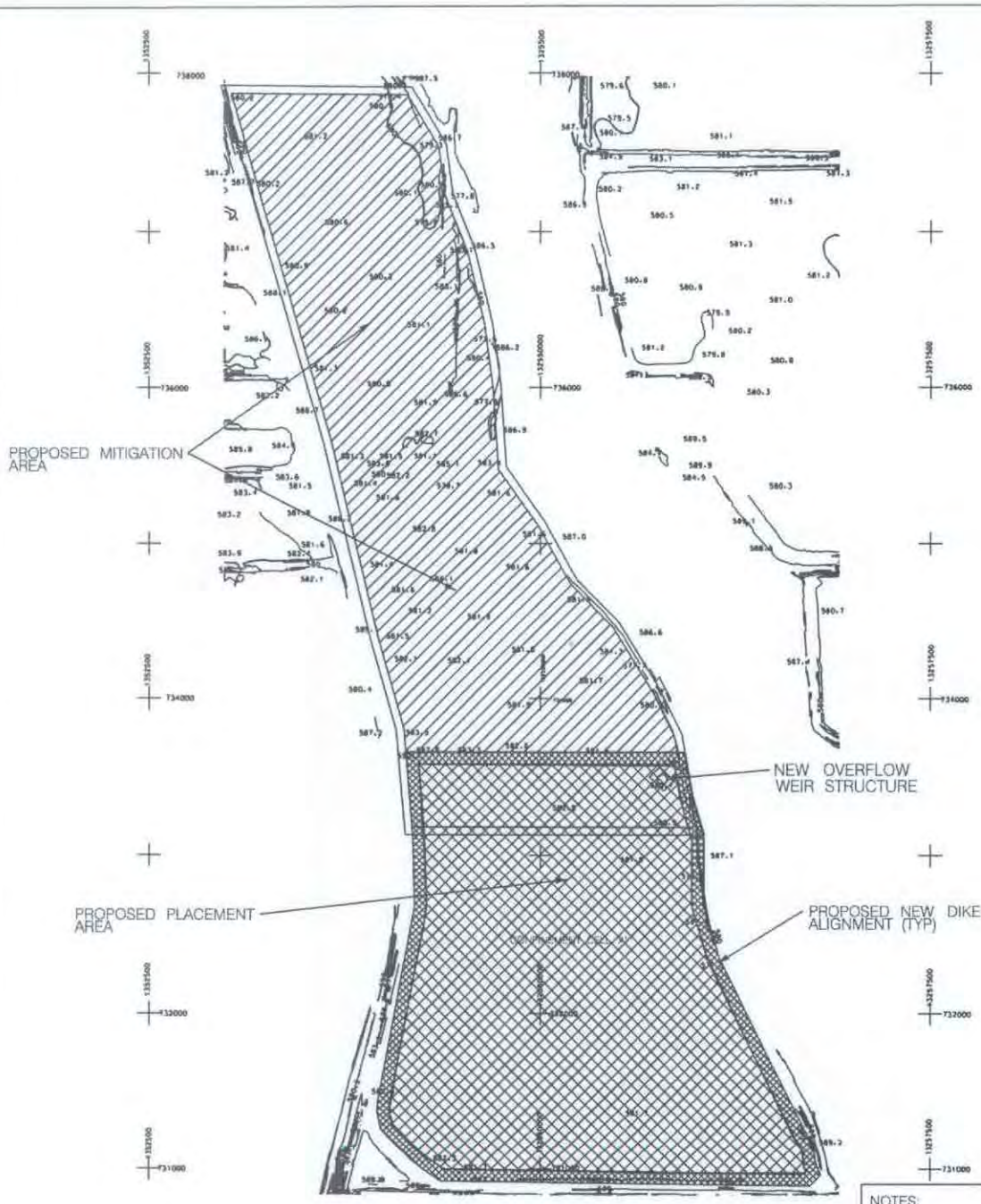
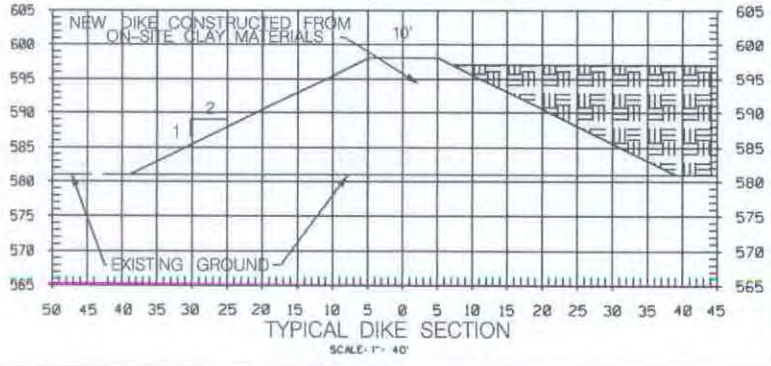


SITE PLAN

250 0 500 1000FT

SCALE: 1" = 500'



TYPICAL DIKE SECTION

SCALE: 1" = 40'

NOTES:

1. THE TOTAL AREA OF THE SITE IS APPROXIMATELY 274 ACRES.
2. THE AREA OF THE PROPOSED (HACHURED) PLACEMENT AREA IS APPROXIMATELY 131 ACRES.
3. THE AREA OF THE PROPOSED MITIGATION AREA IS APPROXIMATELY 143 ACRES.

U.S. ARMY ENGINEER DISTRICT, DETROIT
CORPS OF ENGINEERS
DETROIT, MICHIGAN

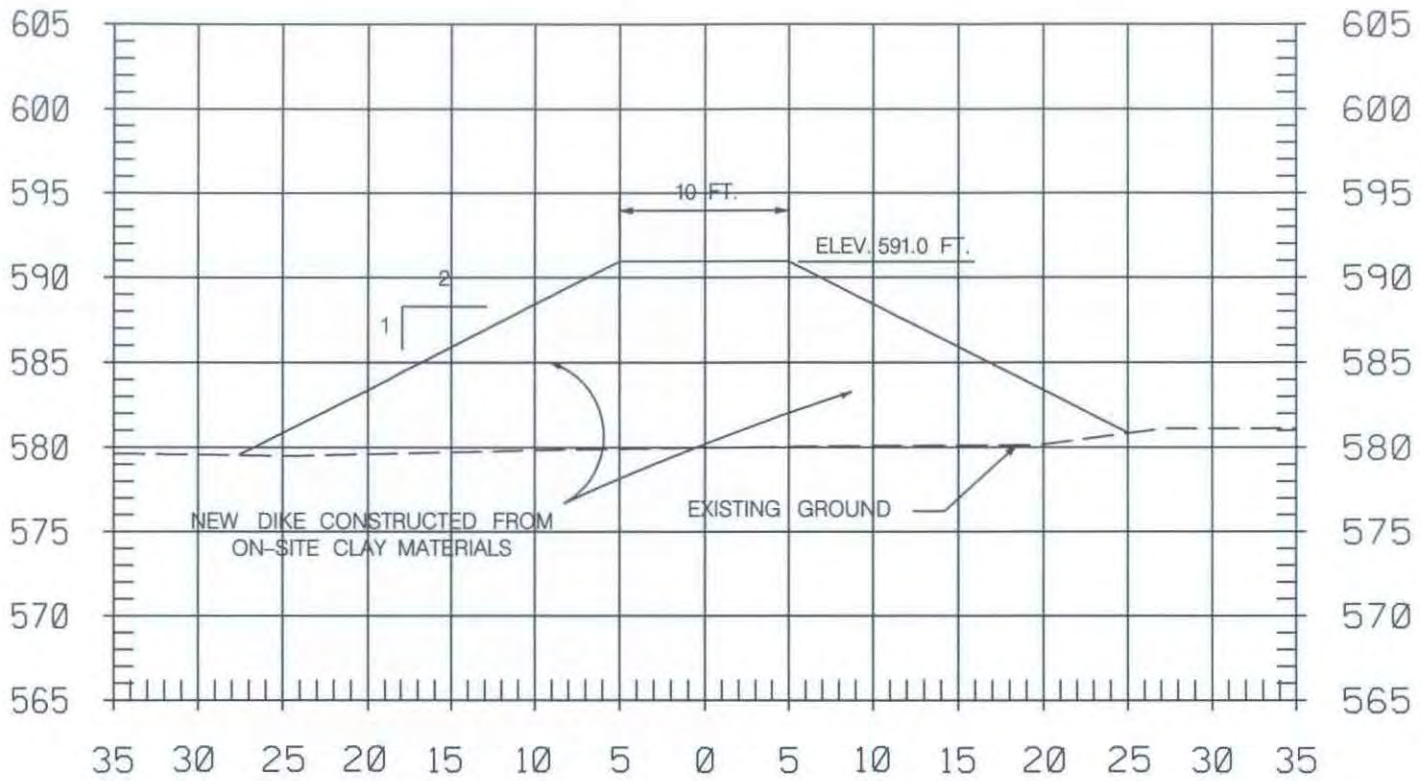
UPPER SAGINAW RIVER, MICHIGAN

PROPOSED DREDGED MATERIAL PLACEMENT SITE (EAST)

SITE PLAN

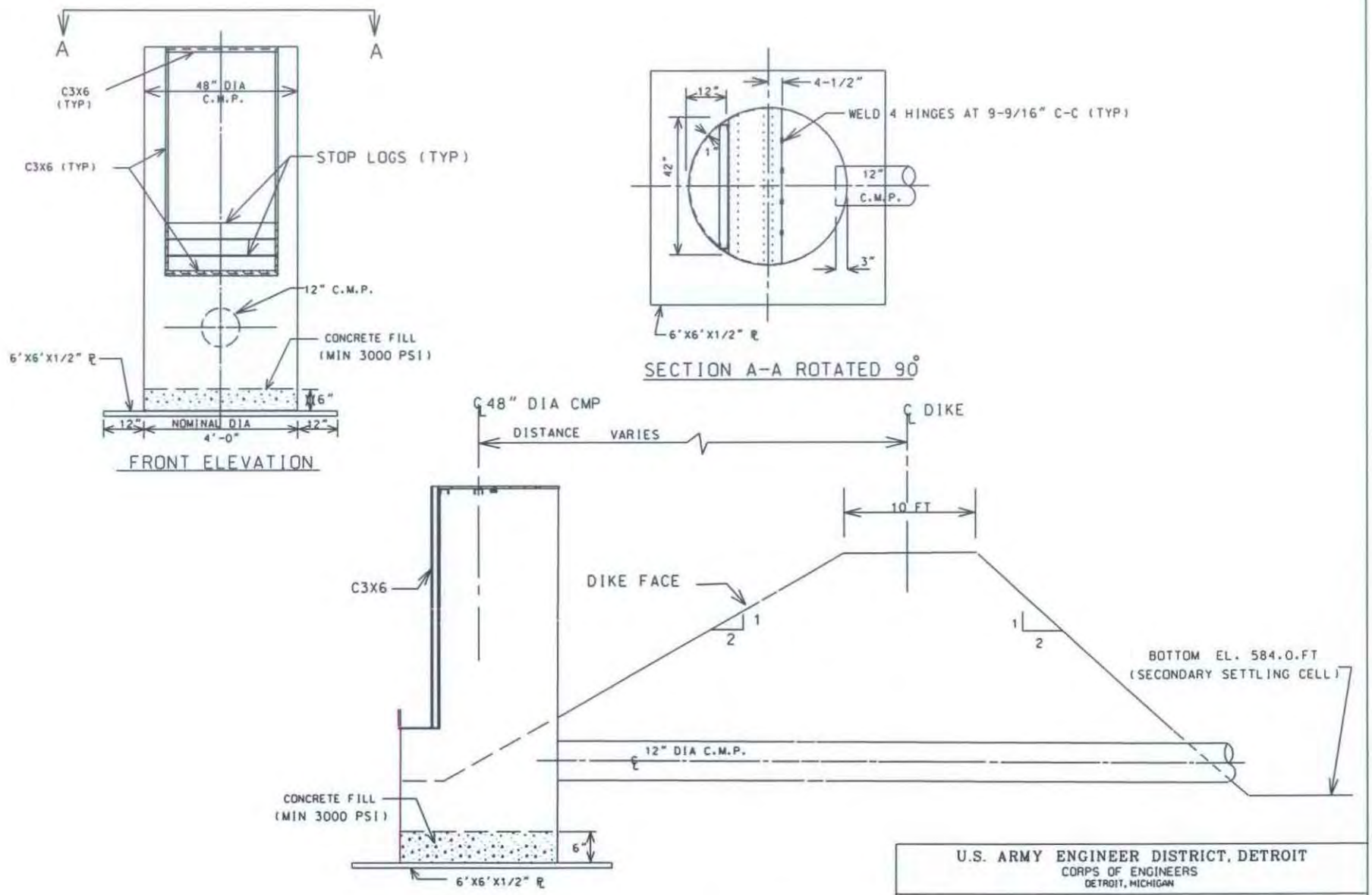
DRAWN BY:	CHECKED BY:
PJO	KJW
DATE: 10 MAY 2004	FIGURE 3

A-3



TYPICAL DIKE SECTION

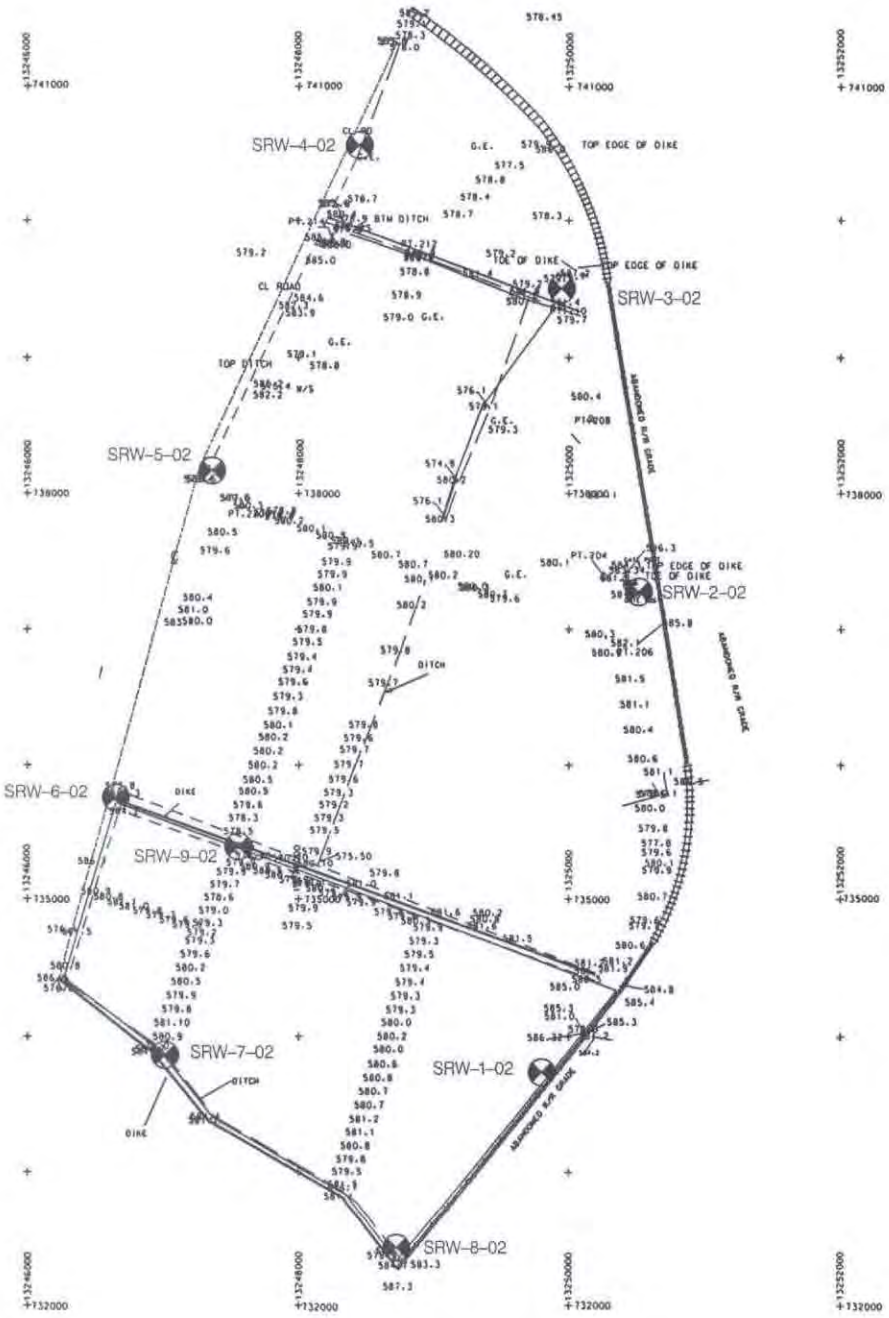
U.S. ARMY ENGINEER DISTRICT, DETROIT CORPS OF ENGINEERS DETROIT, MICHIGAN	
UPPER SAGINAW RIVER, MICHIGAN DREDGED MATERIAL MANAGEMENT PROGRAM TYPICAL DIKE SECTION - WEST SITE	
DRAWN BY: PJO	CHECKED BY: KJW
DATE: 10 MAY 04	FIGURE 4



OVERFLOW WEIR

NO SCALE

U.S. ARMY ENGINEER DISTRICT, DETROIT CORPS OF ENGINEERS DETROIT, MICHIGAN	
UPPER SAGINAW RIVER, MICHIGAN DREDGED MATERIAL MANAGEMENT PROGRAM OVERFLOW WEIR	
DRAWN BY: PJO	CHECKED BY: KJW
DATE: 10 MAY 04	FIGURE 5



U.S. ARMY ENGINEER DISTRICT, DETROIT CORPS OF ENGINEERS DETROIT, MICHIGAN	
UPPER SAGINAW RIVER, MICHIGAN DREDGED MATERIAL MANAGEMENT PROGRAM SOIL BORING LOCATIONS - WEST SITE	
DRAWN BY: PJO	CHECKED BY: KJW
DATE: 10 MAY 04	FIGURE 6

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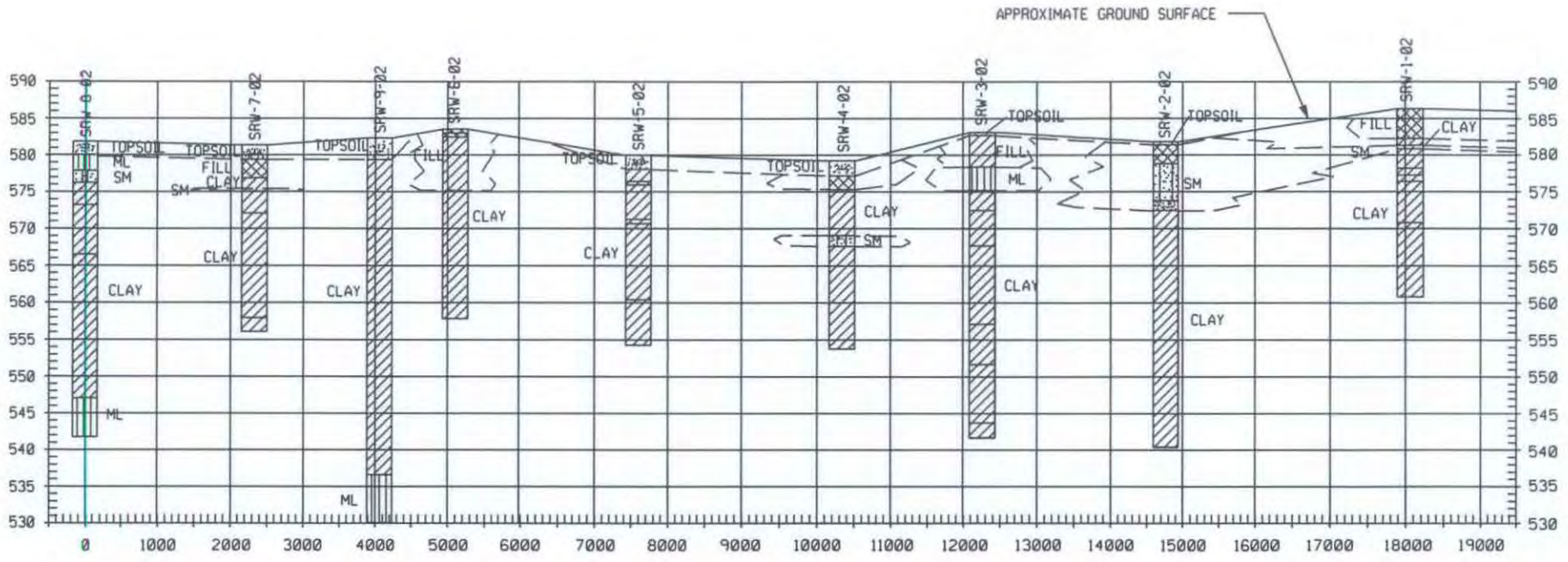
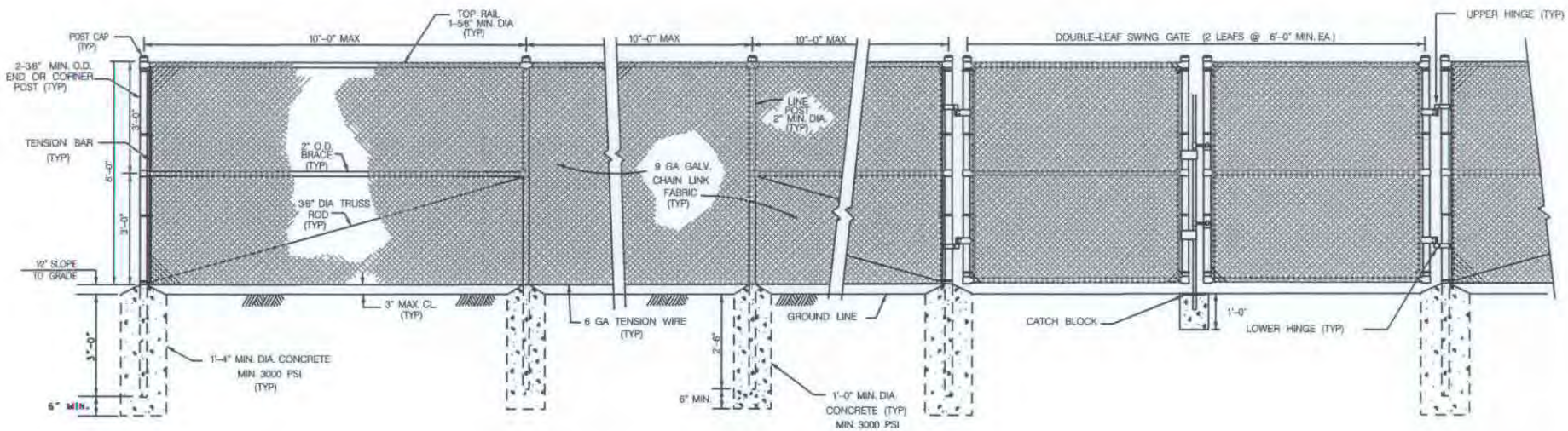


SOIL PROFILE

U.S. ARMY ENGINEER DISTRICT, DETROIT CORPS OF ENGINEERS DETROIT, MICHIGAN	
UPPER SAGINAW RIVER, MICHIGAN DREDGED MATERIAL MANAGEMENT PROGRAM SOIL PROFILE - BUENA VISTA SITE	
DRAWN BY: PJO	CHECKED BY: KJW
DATE: 10 MAY 04	FIGURE 7



PERIMETER SECURITY FENCE

NOT TO SCALE

U.S. ARMY ENGINEER DISTRICT, DETROIT CORPS OF ENGINEERS DETROIT, MICHIGAN	
UPPER SAGINAW RIVER, MICHIGAN DREDGED MATERIAL MANAGEMENT PROGRAM SECURITY FENCE	
DRAWN BY: PJO	CHECKED BY: KJW
DATE: 10 MAY 04	FIGURE 8

A-8

CALCULATIONS

COMPUTATION SHEET

PROJECT UPPER SAGINAW RIVER DMMP — SHEET NO. 1 OF 2 SHEETS

ITEM PLACEMENT AREA DESIGN — DATE 7/23/03

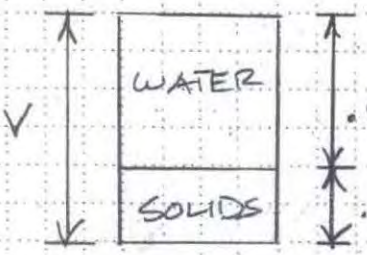
SUBJECT TYPICAL DISPOSAL CELL DIKE DESIGN — FILE

COMPUTED BY pjo — CHECKED BY — REF DRAWING NO.

GENERAL

THE DESIGN OF A TYPICAL CELL ASSUMES THE THE CAPACITY TO CONTAIN ONE SEASON OF ANNUAL MAINTENANCE DREDGING = 150,000 CY. PLUS THE TRANSPORT WATER.

FROM EXPERIENCE, ASSUME THAT THE DREDGED SEDIMENTS WILL CONTAIN 20% SOLIDS AND 80% WATER. BASED ON REMOVAL OF 150,000 CY OF IN-PLACE MATERIALS, THE TOTAL VOLUME OF SOLIDS & WATER IS:



$.2V + .8V = V$

WHERE $.2V = 150{,}000$ CY

$\rightarrow 150{,}000 \text{ CY} + .8V = V$

$150{,}000 = V - .8V$

$\therefore V = \frac{150{,}000}{.2} = 750{,}000$ CY

THE AVAILABLE CONFINEMENT AREA = 281 ACRES THE RESULTING HEIGHT OF WATER/SOLIDS IS:

$$H = \frac{750{,}000 \text{ CY} \times 27 \text{ FT}^3/\text{CY}}{281 \text{ ACRES} \times 43{,}560 \text{ FT}^3/\text{ACRE}}$$

$= 1.65$ SAY 2.0 FT.

BECAUSE THE RELATIVELY LARGE AREA PERMITS THE RETENTION OF ALL OF THE TRANSPORT WATER, THE PONDING DEPTH AND FREEBOARD WILL BE ASSUMED TO BE EQUAL WHICH IS TYPICALLY 2.0 FT.

COMPUTATION SHEET

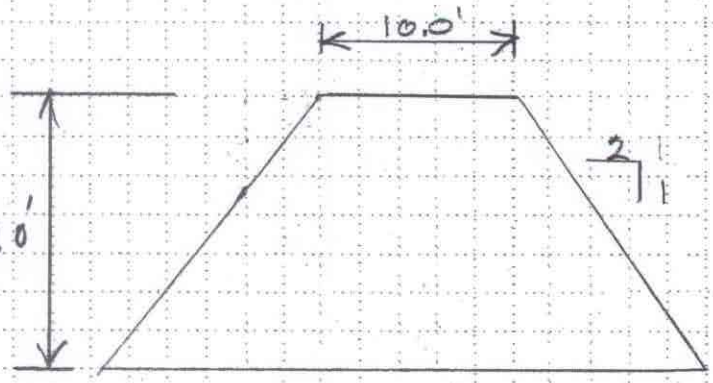
PROJECT UPPER SAGINAW RIVER DMMP SHEET NO. 2 OF 2 SHEETS

ITEM PLACEMENT AREA DESIGN DATE

SUBJECT TYPICAL DISPOSAL CELL DIKE DESIGN FILE

COMPUTED BY RJO CHECKED BY REF DRAWING NO

THEREFORE THE TYPICAL DIKE SECTION ASSUMES A MINIMUM CREST WIDTH OF 10.0 FT AND SIDESLOPES OF 1 VERTICAL ON 2 HORIZONTAL, THE SIDESLOPE DIMENSIONS ARE BASED ON USING EXISTING ON-SITE MATERIALS FOR BORROW WHICH CONSISTS OF BROWN MEDIUM TO STIFF CLAY.



TYPICAL DIKE SECTION – NEW DIKE

THE AVERAGE DEPTH OF SOLIDS AFTER DEWATERING IS:

$$\frac{150{,}000\ CY \times 27\ FT^3/CY}{281\ ACRES \times 43{,}560\ FT^2/ACRE} = 0.33\ FT$$

THE DESIGN LIFE OF THE CONFINEMENT SITE IS 20 YEARS. ASSUMING THAT BULKING AND CONSOLIDATION ARE EQUAL, THE FINAL HEIGHT OR DEPTH OF FILL IS:

$$20\ YRS \times 0.33\ FT/YR = 6.0\ FT.$$

THE FINAL DIKE HEIGHT THEREFORE EQUALS THE DEPTH OF FILL PLUS FREEBOARD FOR FLOODING PLUS FREEBOARD FOR INTERIOR WATER:

$$H_D = 6.0 + 3.0 + 2.0 = 11.0\ FT$$

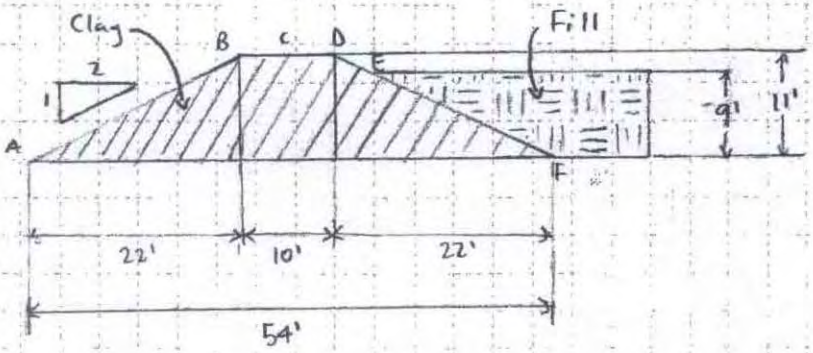
COMPUTATION SHEET

PROJECT Upper Saginaw CDF - West
SUBJECT
ITEM Volume Calculations
COMPUTED BY RKP CHECKED BY

DATE 12 May 2004
PAGE 1 OF 3
PAGE OF
REF

Dike Cross Section

Scale: 1" = 20'



Sectional Area (dike)

Area = (22' + 10')(11') = 352 ft²

Perimeters

A = 14,645'

F = 13,685'

$C = \frac{14{,}645' + 13{,}685}{2} = 14{,}165'$

$E = 22' - (\frac{2}{1})(2') = 18'$

$\frac{18'}{54'}(14{,}645' - 13{,}685') + 13{,}685' = 14{,}005'$

Dike Volume

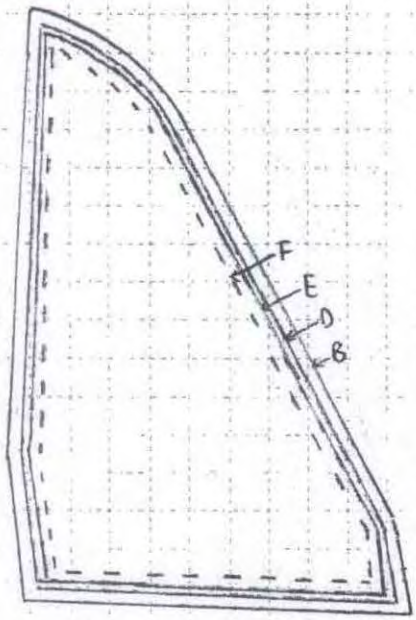
(352 ft²)(14,165') = 4,986,080 ft³ = 184,670 yd³

COMPUTATION SHEET

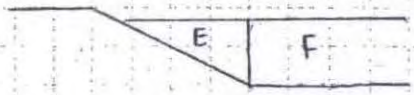
PROJECT Upper Saginaw CDF - West
SUBJECT
ITEM Volume Calculations
COMPUTED BY RKP CHECKED BY

DATE 12 May 2004
PAGE 2 OF 3
PAGE OF
REF

Confinement Cell
No Scale



Fill Section
No Scale



1 acre = 43,560 ft²

Volume E

Area = ½(9')(18') = 81 ft²

Volume = (81ft²)(⅓(14,645' - 13,685') + 13,685') = 1,134,405 ft³ = 42,015 yd³

Volume F

Area = 240.2 acres = 10,463,112 ft²

Volume = (10,463,112 ft²)(9') = 94,168,008 ft³ = 3,487,704 yd³

Total Fill Volume

42,015 yd³ + 3,487,704 yd³ = 3,529,719 yd³
+ 184,670 yd³ Dike Material Fill
3,714,389 yd³

* Assuming Confinement Cell is flat and at equal elevation to bottom of dike.

COMPUTATION SHEET

PROJECT Upper Saginaw CDF - West
SUBJECT
ITEM Volume Calculations
COMPUTED BY RKP CHECKED BY

DATE 13 May 2004
PAGE 3 OF 3
PAGE OF
REF

Topsoil Removement Adjustment

Topsoil Removed = (1')(80 acres) = (1')(3,484,800 ft²) = 3,484,800 ft³ = 129,067 yd³

3,714,389 yd³
- 129,067 yd³
3,585,322 yd³ total capacity of CDF

COMPUTATION SHEET

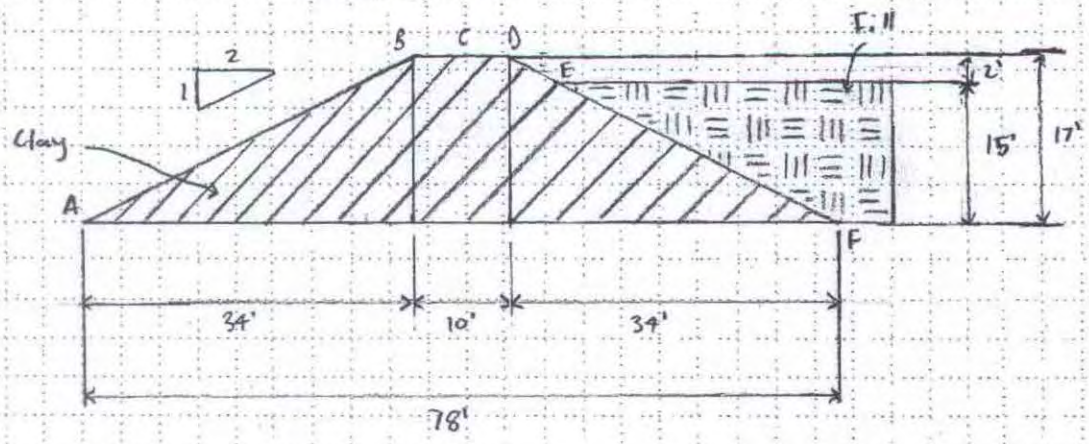
PROJECT Upper Saginaw CDF - East — SHEET NO. 1 OF 3 SHEETS

ITEM — DATE 11 May 2004

SUBJECT Volume Calculations — FILE

COMPUTED BY — CHECKED BY — REF DRAWING NO

Dike Cross Section
Scale: 1" = 20'



Sectional Area (dike)

Area = (34' + 10')(15') = 748 ft²

Perimeters

A = 10,080'

F = 9,511'

C = $\frac{10,080' + 9,511'}{2}$ = 9,796'

E = 34' - $(\frac{2}{1})$2' = 30'

$\frac{30'}{78'}$ (10,080' - 9,511') + 9,511' = 9,730'

Dike Volume

(748 ft²)(9,796') = 7,327,408 ft³ = 271,385 yd³

COMPUTATION SHEET

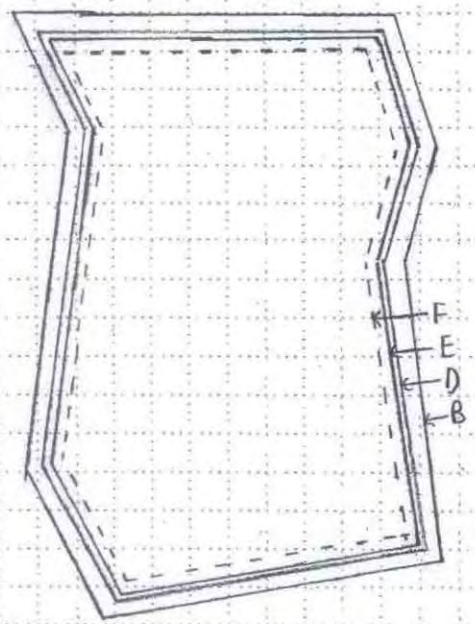
PROJECT Upper Saginaw CDF- East — SHEET NO. 2 OF 3 SHEETS

ITEM — DATE 12 May 2004

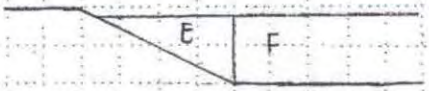
SUBJECT Volume Calculations — FILE

COMPUTED BY — CHECKED BY — REF DRAWING NO

Confinement Cell
No scale



Fill Section
No scale



1 acre = 43,560 ft²

Volume E

Area = ½(15')(30') = 225 ft²

Volume = (225 ft²)(⅓(9730' − 9,511') + 9,511') = 2,156,400 ft³ = 79,867 yd³

Volume F

Area = 119.6 acres = 5,209,774 ft²

Volume = (5,209,774 ft²)(15') = 78,146,610 ft³

Total Fill Volume

2,156,400 ft³ + 78,146,610 ft³ = 80,303,010 ft³ = 2,974,186 yd³

\+ 271,385 yd³ Dike Material Fill

3,245,571 yd³

* Assuming Confinement Cell is flat, and at equal elevation to bottom of dike.

COMPUTATION SHEET

PROJECT Upper Saginaw CDF - East SHEET NO. 3 OF 3 SHEETS

ITEM DATE 12 May 2004

SUBJECT Volume Calculations FILE

COMPUTED BY CHECKED BY REF DRAWING NO.

Topsoil Removement Adjustment

Topsoil Removed = (1')(80 acres) = (1')(3,484,800 ft²) = 3,484,800 ft³ = 129,067 yd³

3,245,571 yd³
− 129,067 yd³
3,116,504 yd³ total capacity of CDF

SAGINAW RIVER PROPOSED CDF SITE
ZILWAUKEE, MICHIGAN

SLOPE STABILITY ANALYSIS

US ARMY CORPS OF ENGINEERS
DETROIT DISTRICT
CIVIL DESIGN SECTION

APRIL 2004

JPW 4/5/13

SAGINAW RIVER PROPOSED CDF SITE
ZILWAUKEE, MICHIGAN

SLOPE STABILITY ANALYSIS

1.0 General

This slope stability analysis is being done to obtain a CLOMA (Conditional Letter of Map Amendment).

2.0 Proposed Project

There are currently levees at an elevation of approximately 587 feet above LWD (NVGD 1929) around a portion of the proposed CDF. The 100-year flood elevation for this area is approximately 588, and FEMA requires a 3-foot freeboard. Therefore, levees for the proposed CDF require a top elevation of 591 feet above LWD.

Instead of building on the old levees, new levees are being constructed on the interior of the old levees (see Figure 1). Material within the proposed CDF will be used as a borrow source.

3.0 Site Geology

Material at the proposed site consists of brown medium to stiff silty clay with varying amounts of silt, sand, and gravel. The clay extends approximately 25 to 60 feet below ground surface. Some silt and silty clay can be found near the surface. A soil profile and geotechnical investigation prepared by STS Consultants is provided as an attachment.

After stripping the topsoil from the surface of the borrow area, the clay from the interior of the proposed CDF will be used as a borrow source for the new levee construction. Two compaction curves done on composite samples showed optimum moisture content of 10.5 and 14.5. The median in-situ moisture content varies from 10% to 35%, with a median value of 19%. Since the on site materials are wet of optimum, it will likely be necessary to implement moisture control measures during construction. The site has a pumping system that is used to control water levels during crop growing seasons that could be used for that purpose. Simpler methods, such as digging trenches through the borrow area and pumping the water that collects, may also be useful.

JPU

4.0 Slope Stability Analysis

Three conditions were analyzed during the slope stability analysis, as discussed below. A normal load of 200 psf was used on the levee crest to account for vehicle loads on the levee during construction, operation, and maintenance of the CDF.

4.1 End of Construction Condition:

Undrained shear strengths determined from Unconsolidated, Undrained (UU, or Q) Tests, as well and Unconfined Compression (UC) were used to determine total stresses. The average shear strength value minus ½ the standard deviations for the UU and UC tests were very comparable at 1078 and 1071 psf. A phi = 0, c=1000 psf analysis was run. This is a conservative assumption that the soil will be saturated and not rely on any frictional strength between soil particles. Even with this conservative assumption, a factor of safety of 4.8 was obtained.

4.2 Steady State Seepage at flood level

This scenerio describes a long-term condition in which steady state seepage has been allowed to occur after water levels have increased to the 100 year flood stage. Direct shear test results were used to determine the effective shear strength of the soil (300 pcf). Again, a phi = 0 was used. A factor of safety of 2.0 was obtained. A steady state seepage was also analyzed at a water level of 586, and had a factor of safety of 1.7

4.3 Sudden Drawdown after flood level

Sudden Drawdown conditions assume that after the system has reached steady state seepage at the flood stage of 588 feet above LWD, the water level will drop faster than the soil can drain. Effective stresses and phi = 0 was used in this analysis. This was the most critical analysis, with a factor of safety of 1.5.

JRW

Table 1: Slope Stability Results

Analysis	Unit Weight	Cohesion	Angle of Internal Friction	Water elevation	Factor of Safety	Minimum required[1]
End of Construction	115 pcf	1000 pcf	0	583	4.8	1.3
Steady State Seepage at flood level	115	300 (effective)	0	588	2.0	1.4
Steady State at H20 - 586	115	300 (effective)	0	586	1.7	1.4
Sudden Drawdown	115	300 (effective)	0	583	1.5	1.0

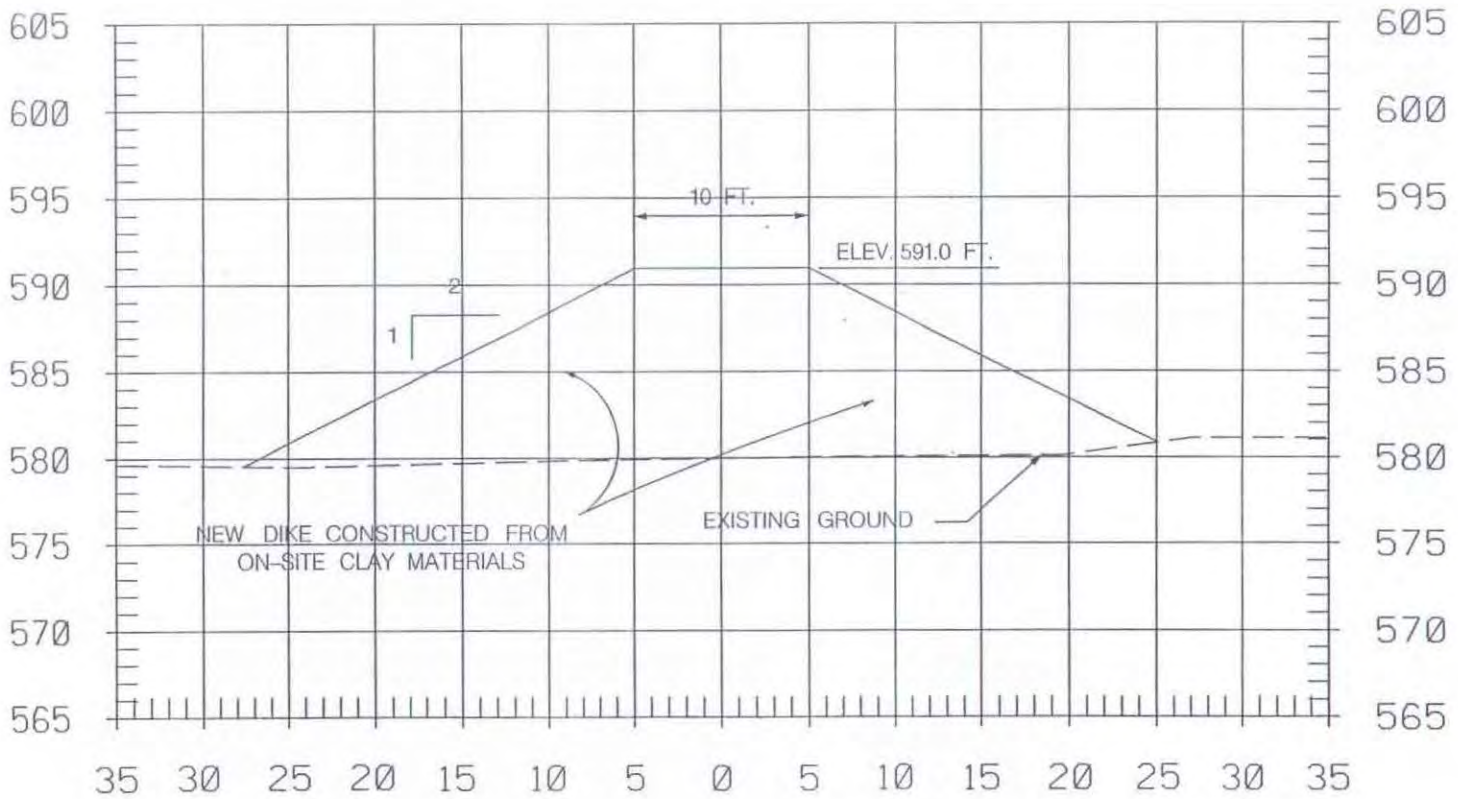
1. EM-1110-2-1913, Table 6-1b

5.0 Hydrocompaction:

Hydrocompaction is subsidence due to the compaction of soils through the loss of water. This can be significant in loose soils. Hydrocompaction is not an issue at this site, since we are requiring 90% maximum density compaction. In addition, the clays have a low PI, and are not high swelling clays.

6.0 Conclusions:

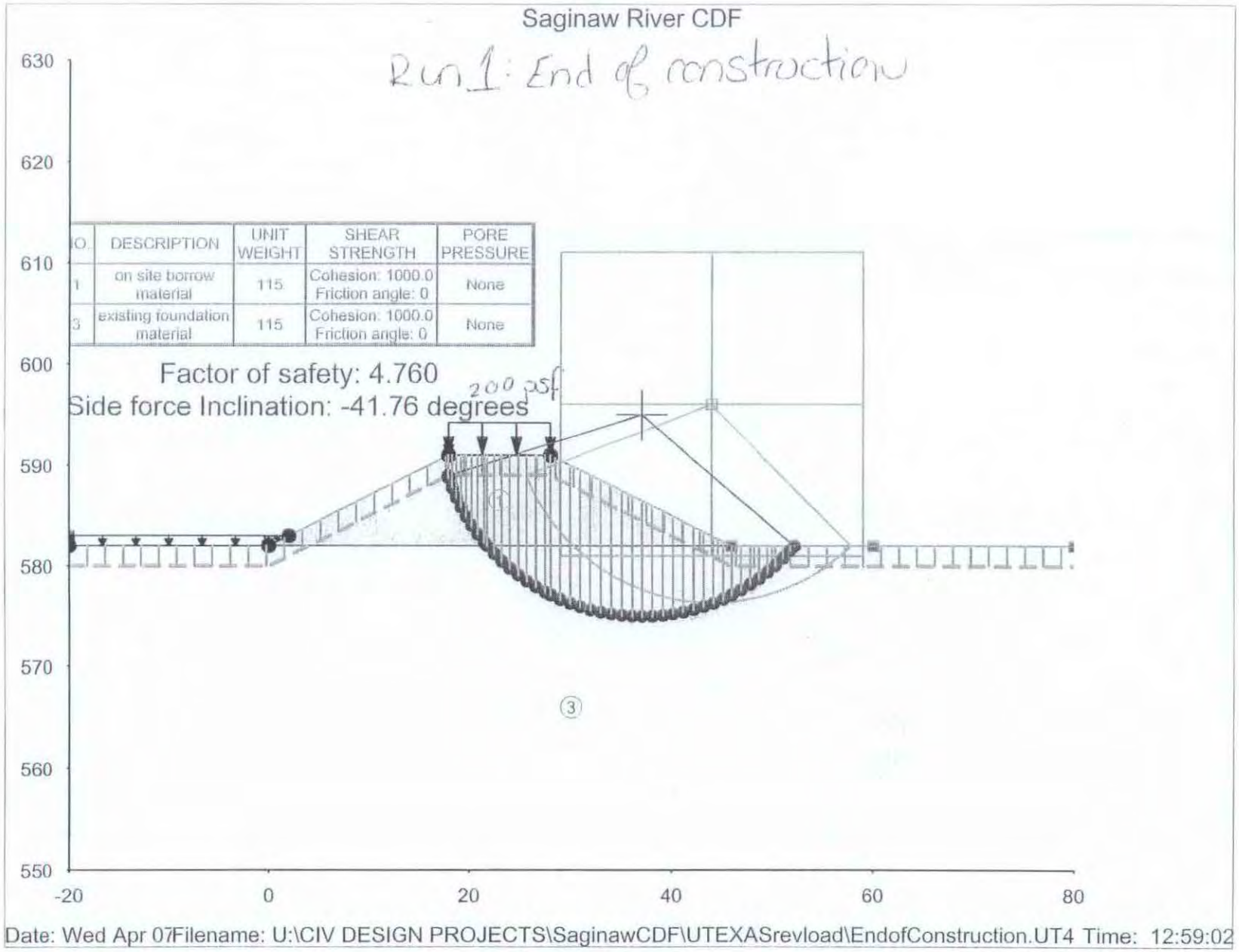
The designed levee cross-section meets all minimum factors of safety for end of construction, steady state seepage, and sudden drawdown conditions. On site borrow material is wet of optimum, and moisture control will need to be implemented to reach the recommended compaction to 90% of maximum density. This analysis assumes that the levees will be properly maintained. Animal burrows and trees can significantly impact the stability of the levee slopes.

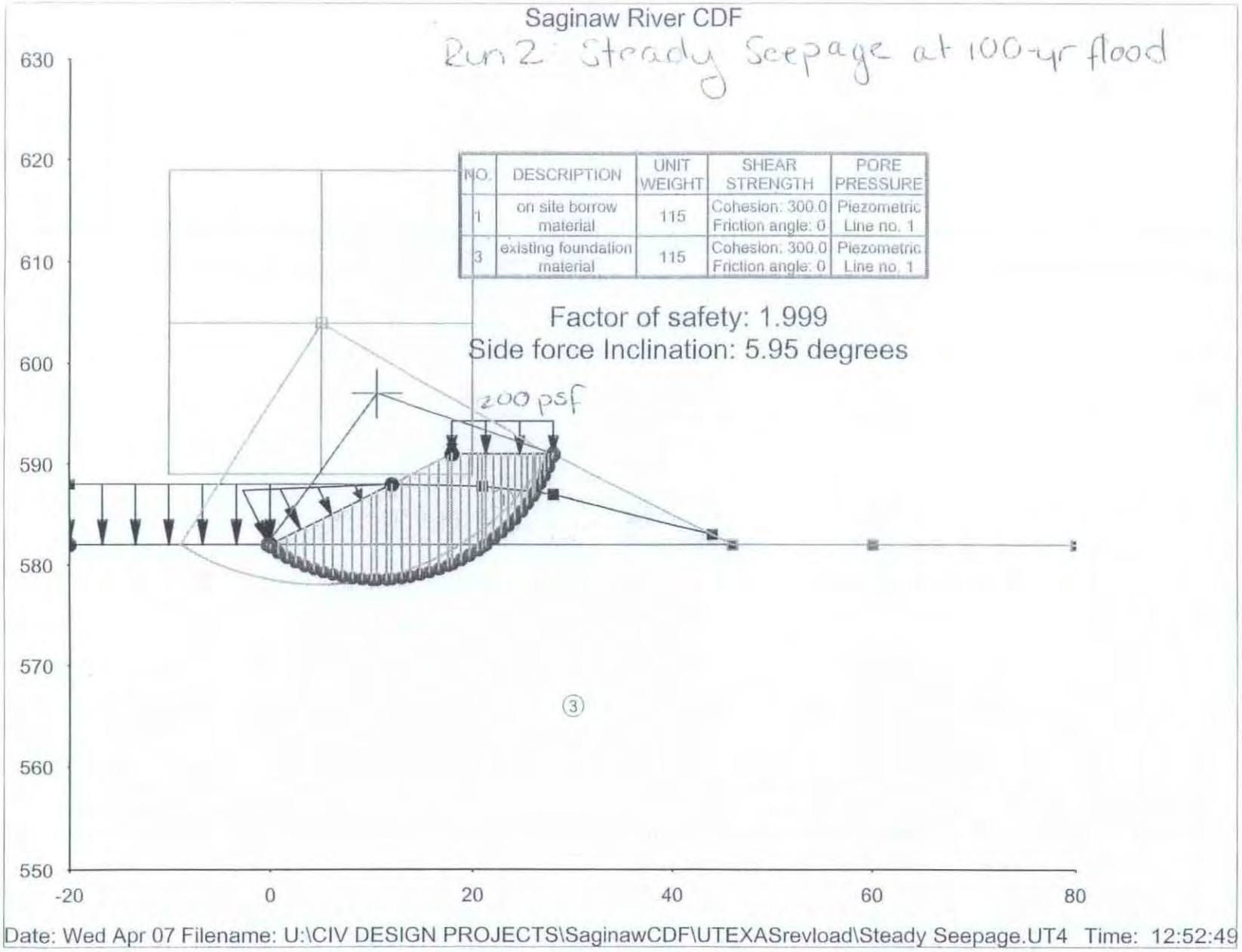


TYPICAL DIKE SECTION

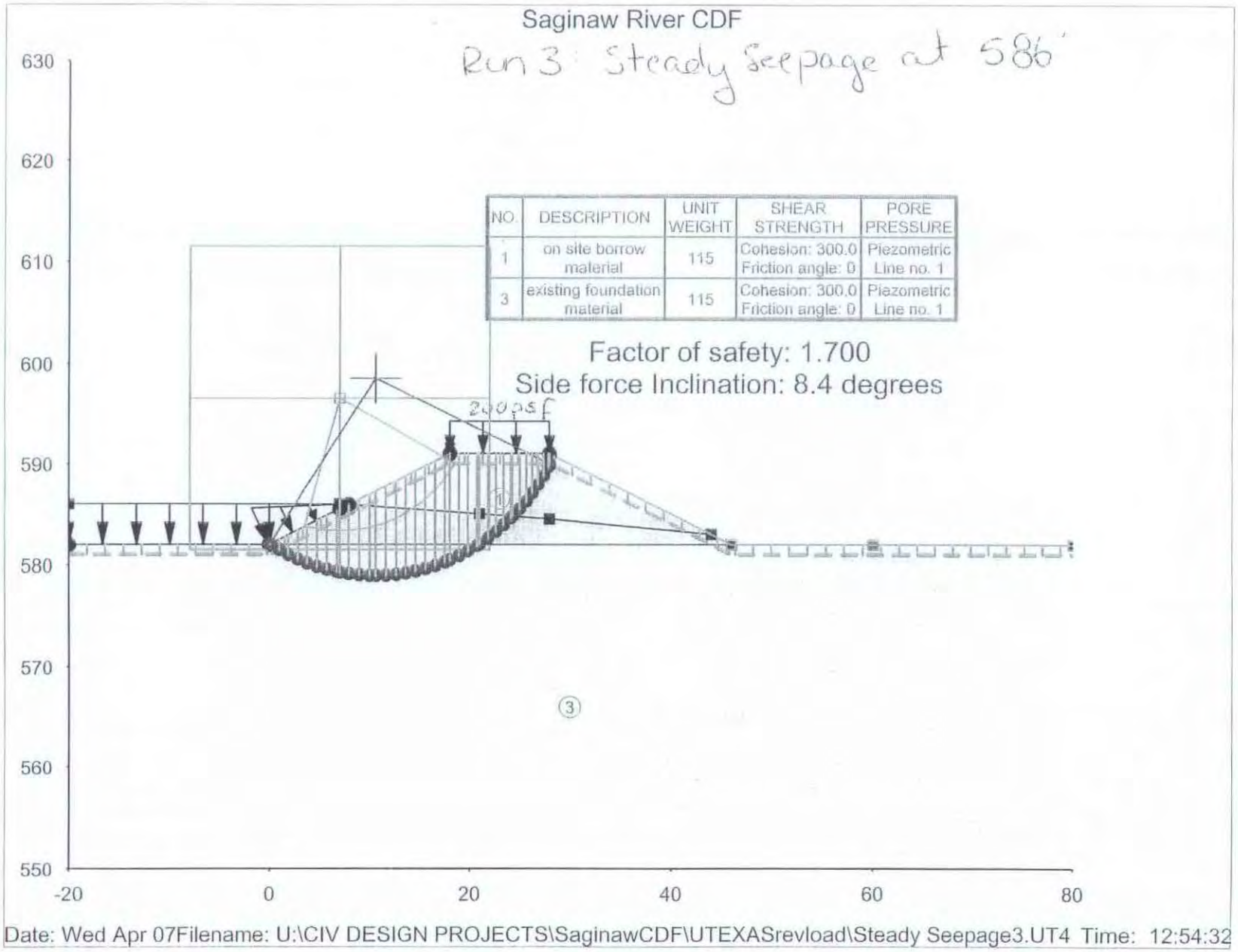
U.S. ARMY ENGINEER DISTRICT, DETROIT CORPS OF ENGINEERS DETROIT, MICHIGAN	
UPPER SAGINAW RIVER, MICHIGAN DREDGED MATERIAL MANAGEMENT PROGRAM TYPICAL DIKE SECTION – WEST SITE	
DRAWN BY: PJO	CHECKED BY: KJW
DATE: 10 MAY 04	FIGURE 1

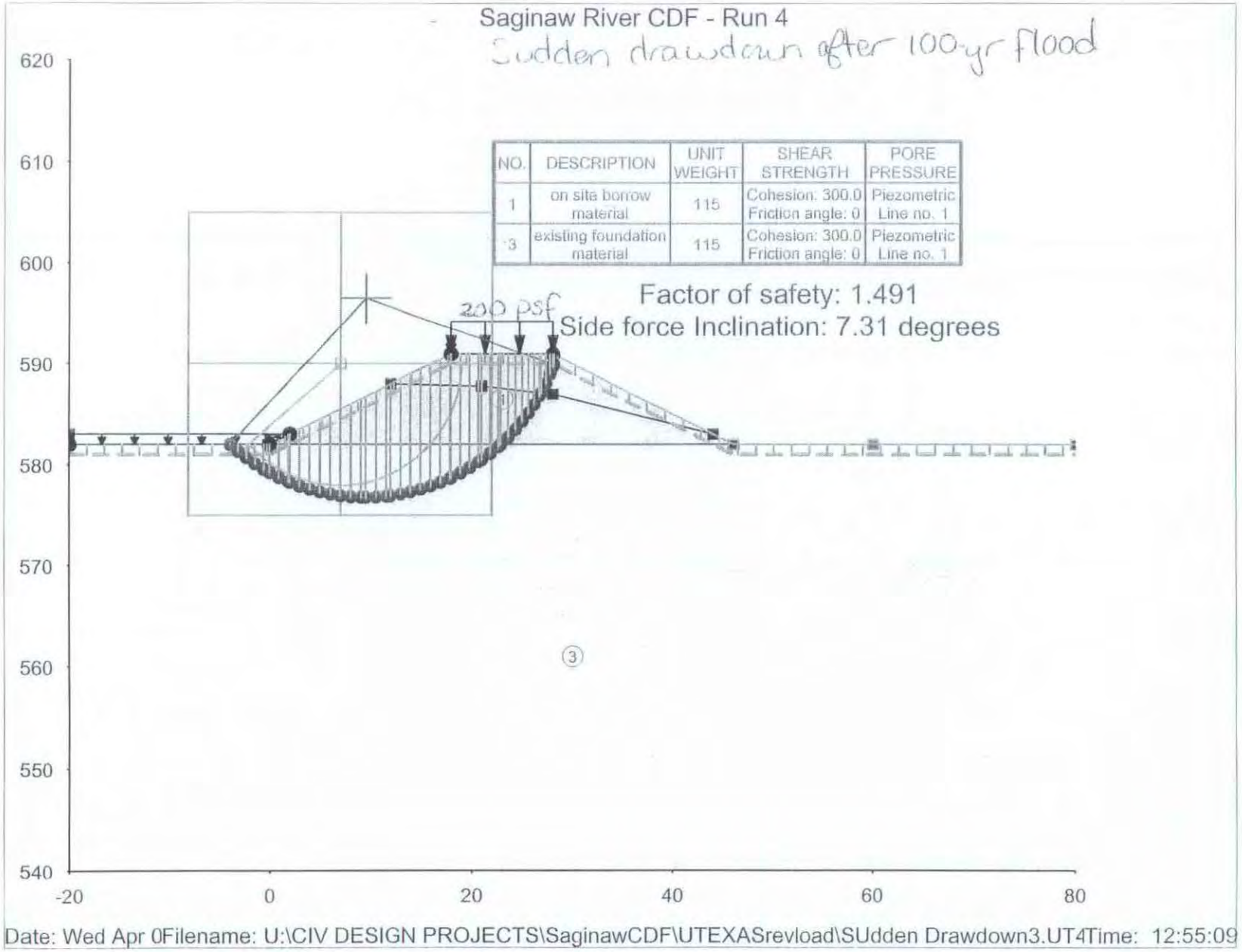
...\uppersag\typicalsec.dgn 07/07/2004 08:39:47 AM


Saginaw River CDF
Run 1: End of construction
NO.
DESCRIPTION
UNIT WEIGHT
SHEAR STRENGTH
PORE PRESSURE
1
on site borrow material
115
Cohesion: 1000.0 Friction angle: 0
None
3
existing foundation material
115
Cohesion: 1000.0 Friction angle: 0
None
Factor of safety: 4.760
Side force Inclination: -41.76 degrees
200 psf
630
620
610
600
590
580
570
560
550
-20
0
20
40
60
80
Date: Wed Apr 07Filename: U:\CIV DESIGN PROJECTS\SaginawCDF\UTEXASrevload\EndofConstruction.UT4 Time: 12:59:02


Saginaw River CDF
Run 2 Steady Seepage at 100-yr flood
NO. | DESCRIPTION | UNIT WEIGHT | SHEAR STRENGTH | PORE PRESSURE
1 | on site borrow material | 115 | Cohesion: 300.0 Friction angle: 0 | Piezometric Line no. 1
3 | existing foundation material | 115 | Cohesion: 300.0 Friction angle: 0 | Piezometric Line no. 1
Factor of safety: 1.999
Side force Inclination: 5.95 degrees
200 psf
630
620
610
600
590
580
570
560
550
-20
0
20
40
60
80
Date: Wed Apr 07 Filename: U:\CIV DESIGN PROJECTS\SaginawCDF\UTEXASrevload\Steady Seepage.UT4 Time: 12:52:49

A-22


Saginaw River CDF
Run 3 Steady Seepage at 586'
NO. | DESCRIPTION | UNIT WEIGHT | SHEAR STRENGTH | PORE PRESSURE
1 | on site borrow material | 115 | Cohesion: 300.0 Friction angle: 0 | Piezometric Line no. 1
3 | existing foundation material | 115 | Cohesion: 300.0 Friction angle: 0 | Piezometric Line no. 1
Factor of safety: 1.700
Side force Inclination: 8.4 degrees
240psf
630
620
610
600
590
580
570
560
550
-20
0
20
40
60
80
Date: Wed Apr 07Filename: U:\CIV DESIGN PROJECTS\SaginawCDF\UTEXASrevload\Steady Seepage3.UT4 Time: 12:54:32


Saginaw River CDF - Run 4
Sudden drawdown after 100-yr flood
NO. | DESCRIPTION | UNIT WEIGHT | SHEAR STRENGTH | PORE PRESSURE
1 | on site borrow material | 115 | Cohesion: 300.0 Friction angle: 0 | Piezometric Line no. 1
3 | existing foundation material | 115 | Cohesion: 300.0 Friction angle: 0 | Piezometric Line no. 1
200 psf
Factor of safety: 1.491
Side force Inclination: 7.31 degrees
620
610
600
590
580
570
560
550
540
-20
0
20
40
60
80
Date: Wed Apr 0Filename: U:\CIV DESIGN PROJECTS\SaginawCDF\UTEXASrevload\SUdden Drawdown3.UT4Time: 12:55:09

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5.0 EXPLORATION RESULTS

5.1 Site Activities

The STS engineer and drillers mobilized to the site on July 30, 2002. Drilling and sampling began on July 30th and continued until August 1st. Drilling activities began at the proposed eastern disposal site location where a total of seven borings were drilled and sampled. Four borings were drilled to 25.0 feet, two borings to 40.0 feet and one boring was drilled to 60.0 feet. Once the borings were complete the drill rig was loaded on the trailer and mobilized to the proposed western disposal site location. Nine borings were completed on the western side of the Saginaw River. Six borings were drilled to 25.0 feet, two borings to 40.0 feet and one boring was drilled to 60.0 feet. Six Photographs documenting portions of the field activities are presented in Appendix B.

5.2 Site Conditions

The proposed disposal areas for the Saginaw River sediments are located in Zilwaukee/Buena Vista Townships, Saginaw County, Michigan. Figure 2 illustrates the approximate location of the two proposed containment dike locations. The sites are approximately 0.5 mile northeast of Zilwaukee, Michigan. The elevations at the east site range from approximately 580.0 to 587.8 feet. The elevations at the west site range from approximately 579.3 to 585.7 feet.

5.3 Soil Conditions/Site Comparison

5.3.1 East Site

Four of the seven borings performed on the east site were drilled within the existing dike system. The soil borings were SRE-10-02, SRE-11-02, SRE-14-02 and SRE-16-02. A general description of the fill and natural soil types encountered includes:

TOPSOIL

Topsoil was encountered in borings SRE-14-02 and SRE-16-02 with thicknesses of 1.0 and 0.4 feet. The topsoil typically consists of sand with varying amounts of silt, clay and gravel with trace roots.

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STS Project No. 774062
October 4, 2002

FILL - SAND & GRAVEL

Fill material was encountered while drilling on access roads and on the existing dike system at the east site. At borings SRE-10-02 and SRE-11-02, the fill material consisted of brown medium to coarse gravel with thicknesses of 2.0 feet at each location. The fill material at SRE-10-02 contained broken pieces of red brick or possibly broken pottery shards. A 1.25 foot layer of fine silty sand with trace roots and clay was encountered in the dike (SRE-10-02) at 5.0 feet. Boring SRE-14-02 was drilled on the dike system and contained brown fine silty sand with trace amounts of clay beneath the topsoil. The fill sand extended from a depth of 1.0 to 4.0 feet.

FILL - CLAY

Very stiff to hard silty clay fill (dike material) was encountered in borings SRE-10-02, SRE-11-02, and SRE-16-02 from 2.0 to 8.0 feet. The clay was brown to gray and contained varying amounts of silt, sand and gravel and occasionally small white shells. Boring SRE-14-02 encountered the very stiff to hard clay at 4.0 feet and the fill layer extended to 8.0 feet.

NATURAL SOILS

Cohesive Soils

Brown medium to stiff silty clay was encountered in all seven of the borings completed at the east site. The clay was brown to gray with varying amounts of silt, sand and fine gravel. The clay extends to approximately 25.0 feet in borings SRE-10-02, SRE-11-02, SRE-15-02 and SRE-16-02. Mottled and fractured silty clay was encountered within the silty clay in borings SRE-9-02, SRE-10-02 and SRE-11-02 at depths of 8.0 to 15.0 feet. The brown silty clay extended to 40.0 feet in borings SRE-9-02 and SRE-14. At boring location SRE-13-02, gray silty clay with a soft consistency was encountered at approximately 35.0 feet and extended to the termination depth of the boring at 60 feet.

Granular Soils

Two borings (SRE-15-02 and SRE-16-02) contained brown to black fine silty sand with trace amounts of roots, clay and occasional gravel. The natural sand encountered in borings SRE-15-02 and SRE-16-02 was at a depth of 8.0 feet and was approximately 2.0 feet thick.

5.3.2 West Site

Five of the nine borings performed on the west site were drilled within the existing dike system. These soil borings were SRW-1-02, SRW-3-02, SRW-4-02, SRW-6-02 and SRW-7-02. A general description of the fill and natural soil types encountered include:

TOPSOIL

Topsoil was encountered within all of the west site borings except SRW-1-02 and SRW-6-02. The topsoil typically consists of sand with varying amounts of silt, clay and gravel with trace roots. The minimum thickness of topsoil (0.3 feet) occurred at boring location SRW-2-02 and the maximum thickness (2.0 feet) occurred at SRW-4-02.

FILL - SAND & GRAVEL

Fill material was also encountered while drilling on access roads and on the existing dike system on the west site. Borings SRW-1-02 and SRW-6-02 were the only locations where gravel fill was encountered at the surface with thicknesses of 0.5 and 2.8 feet, respectively. Fill material consisted of brown medium to coarse sand and gravel at both locations with trace pieces of slag at SRW-1-02.

corrected profile.

FILL - CLAY

Silty clay fill (dike material) with a consistency of very stiff to hard was encountered in borings SRW-1-02, SRW-3-02, SRW-4-02, SRW-6-02 and SRW-7-02. The clay which was encountered below the topsoil and gravel fill was brown to gray and contained varying amounts of silt, sand and gravel and occasionally small white shells. Small lenses of sand and/or softer clay were sometimes encountered within the very stiff clay. The clay fill extended to a depth of approximately 8.0 feet at SRW-4-02, SRW-6-02 and SRW-7-02 and 6.0 feet at SRW-1-02 and SRW-3-02.

NATURAL SOILS

Cohesive Soils

Brown medium to stiff silty clay was encountered in all nine of the borings on the east site. The clay was brown to gray with varying amounts of silt, sand and fine gravel. The clay extends to approximately 25.0 feet in borings SRW-1-02, SRW-2-02, SRW-4-02, SRW-5-02, SRW-6-02 and SRW-7-02. Mottled and fractured silty clay was encountered within the silty clay in borings SRW-1-02, SRW-2-02 and SRW-6-02 at 8.0 feet with thicknesses of 1.0, 6.0, and 5.0 feet, respectively. The brown medium silty clay extended to 40 feet in borings SRW-3-02 and SRW-8-02. At boring location SRW-9-02, brown soft silty clay was

encountered at approximately 35.0 feet and was 10.0 feet thick. Brown silty clay (or possibly clayey silt) with a very soft consistency extended from 45.0 to 60.0 feet.

Granular Soils

One boring (SRW-2-02) contained gray fine to medium sand with varying amounts of roots, silt, clay and occasional small white shells. The sand was encountered at a depth of 2.0 feet and was 7.0 feet thick.

The generalized soil profile described above is noted on the respective boring logs included in the Appendix B. Please refer to those logs for a more detailed description of the soils encountered at specific boring locations. Geologic profiles of the soils encountered at the east and west sites have been included as Figures 4 and 5.

5.4 Groundwater Table Conditions

Groundwater level readings were obtained in each boring during and after drilling and sampling operations. The groundwater elevations varied considerably across both proposed sites. The groundwater on the eastern side of the Saginaw River ranged from 8.5 to 20.0 feet below ground surface while drilling. Three of the seven boring locations did not encounter water while drilling and sampling. The groundwater on the western side of the Saginaw River ranged from 5.0 to 24.3 feet below ground surface while drilling. Three of the nine boring locations did not encounter water while drilling and sampling. Groundwater levels encountered at each boring location are located on the boring logs included in Appendix A. It should be noted, however, that groundwater levels obtained from soil borings may not reflect the natural long-term elevation of the groundwater table. Monitor wells would be required if more accurate or long-term monitoring of the groundwater levels is required.

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STS Project No. 774062
October 4, 2002

6.0 GENERAL QUALIFICATIONS

The analysis and recommendations submitted in this report are based on data obtained from soil borings. Variations can occur between these borings; the nature and extent of which may not become evident until after construction. If variations are encountered, it may be necessary to make a re-evaluation of the recommendations of this report after making on-site observations and noting characteristics of these variations.

Water level readings have been made in the borings at the time and under the conditions stated on the boring logs. This data has been reviewed and an interpretation made in the text of this report. However, it must be noted that the period of observation was relatively short, and that seasonal and annual fluctuations in the level of the groundwater will likely occur.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices to aid in the evaluation of this property, and to assist the Agency and their Engineer in the design of this project. No other warranty, expressed or implied, is made. The scope of this report is limited to the specific project and location described herein, and our description of the project represents our understanding of the significant aspects relevant to soil and foundation characteristics. In the event any changes in the design or location of the structures as outlined in this report are planned, we should be informed so the changes can be reviewed, and the conclusion of this report modified and approved in writing by the Geotechnical Engineer.

As a check, we recommend that STS be authorized to review project plans and specifications to confirm that the recommendations of this report have been interpreted in accordance with our intent. Without this review, STS Consultants will not be responsible for misinterpretation of our data, our analyses, and/or our recommendations or how these are incorporated into the final design.

DRAWN BY CJD | DATE 09\18\02
CHECKED BY | DATE
APPROVED BY | DATE
CADFILE W:\PROJECTS\74062\0774026200 2.dwg

GEOTECHNICAL SOIL BORING LOCATIONS
GEOTECHNICAL EVALUATION
SAGINAW RIVER
U.S. ARMY ENGINEER DISTRICT - DETROIT
ZILWAUKEE, MICHIGAN

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO.	74062
STS PROJECT FILE	74062
SCALE	1"=2000'
FIGURE NO.	2

APPENDIX B

COST ENGINEERING REPORT

FOR THE

PHASE II, REPORT
DREDGED MATERIAL MANAGEMENT PLAN
UPPER SAGINAW RIVER, MICHIGAN

APPENDIX B
COST ENGINEERING REPORT
FOR THE
DREDGED MATERIAL MANAGEMENT PLAN
UPPER SAGINAW RIVER, MICHIGAN

1. Introduction

1.1 Commercial Navigation Channel The channel limits identified as the Upper Saginaw River DMMP study are from a point 4.7 miles upstream from the entrance of the Saginaw River to 22 miles upstream from the entrance of the Saginaw River.

The entire Saginaw River system is monitored for shoaling by the U.S. Army Corps of Engineers (COE). Maintenance dredging is performed at locations where the shoaling threatens safe navigation or encroaches on project depths.

Currently, the dredged material from the Upper Saginaw River has no Dredged Material Disposal Facility (DMDF) identified. An Upper Saginaw River DMDF must be able to contain at a minimum, a 20-year dredged material capacity, which in this case is 3,100,000 cubic yards (cy).

1.2. DMMP Alternatives In the final development of dredged material management plans for material dredged from the Upper Saginaw River, two alternative plans identified are:

a. **Alternative 1 - Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility.**

This alternative consists of constructing an upland dredged material disposal facility on a large parcel (281 acres) west of the Saginaw River, approximately 11 miles upstream of the mouth of Saginaw River, west of the city of Bay City, Michigan.

b. Alternative 2 - Develop the Buena Vista Township Site, East of Saginaw River, into a Dredged Material Disposal Facility.

This alternative consists of constructing an upland dredged material placement site (131 acres) east of the Saginaw River, approximately 11 miles upstream of the mouth of Saginaw River, in the city of Bay City, Michigan.

2. Purpose and Scope of Cost Engineering Appendix

2.1. The purpose of this appendix is to present the cost estimates associated with the two alternative plans identified in the preceding paragraphs. It is prepared in accordance with National Harbors Program: Dredged Material Management Plan, "EC 1165-2-200", policy, dated 21 July 1994.

Excel is used to present the alternative cost estimates in this appendix

3. **Alternative 1 - Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility.**

This parcel is approximately 281 acres in size of the 581-acre site. It is located west of Melbourne Road, bordering along Saginaw and Bay counties in Zilwaukee Township, Michigan. This proposed site is presently used as farmland. This site has existing earthen dikes constructed around its perimeter (built prior to 1965). Dredged material would be placed by hydraulic dredging method. There is a Michigan Department of Natural Resources (MDNR) game reserve (Crow Island Game area) located adjacent to the west and south side of the proposed site, and an abandon railroad track lies along its eastern perimeter.

4. **Alternative 2 - Develop the Buena Vista Township Site, East of Saginaw River, into a Dredged Material Disposal Facility.**

This parcel is approximately 131 areas in size of a 274-acre site and is located east of Bay City Road, southeast of the confluence of Cheboyganing Creek and Saginaw River. This site also lies on the border of Saginaw and Bay counties, but is in Buena Vista Township, Michigan. This proposed site is presently used as farmland. This site has existing earth dikes constructed around its perimeter, which were built prior to 1965. Dredged material would be placed by hydraulic dredging method. There is a Michigan Department of Natural Resources (MDNR) game reserve (Crow Island Game area) located southwest of the proposed site and an active railroad track lies along the western perimeter.

5. **Alternative Cost Estimates**

5.1. Construction quantities in the technical appendix are used in the cost estimates presented in this appendix. Additional quantities and features that should be considered for each alternative have been computed by the cost engineering personnel and included in the cost estimate. The quantities are, therefore, substantially complete from the standpoint of biddability, constructibility, and operability of each alternative. (See Table 1)

5.2. As part of the risk analysis (range estimating), contingencies are included to identify the high range of each line item in the estimates. These contingencies are based on a percentage of the total estimated cost for each line item. A 25 percent contingency is used for items in the estimate based on the nature of the engineering and design details and quantity take-offs currently available and experience in implementing these specific line items. Other contingency percent rates used for specific items reflect the reliability of specific engineering, design, and other details available at this time.

Harbor/River:	SAGINAW RIVER	PLANNING ESTIMATES							
State:	Michigan	Table 1							
Project Name:									
(Describe) :	Upper Saginaw River DMMP Study	Date of Estimate: May 2004							
		EPD: September 2004							
		Alternative 01				Alternative 02			
CWBS No.	Bid Item No.	Description of Features/Sub-Features	Place material in Zilwaukee Twp., West of Saginaw River				Place material in Buena Vista Twp., East Saginaw River			
			Quantity	UOM	U.P.	Estimate	Quantity	UOM	U.P.	Estimate
		Dredged Material Disposal Facility								
	1	Mobilization and Demobilization	1.00	L.S.	$50,000.00	$50,000.00	1.00	L.S.	$50,000.00	$50,000.00
	2	Clearing and Grubbing	8.00	Acres	$2,500.00	$20,000.00	10.00	Acres	$2,500.00	$25,000.00
	3	Stripping Unsuitable Material	145,000.00	C.Y.	$2.25	$326,250.00	129,000.00	C.Y.	$2.25	$290,250.00
	4	Excavate Clay	191,000.00	C.Y.	$1.45	$276,950.00	271,000.00	C.Y.	$1.45	$392,950.00
	5	Construct New Dikes	191,000.00	C.Y.	$2.90	$553,900.00	271,000.00	C.Y.	$2.90	$785,900.00
	6	Install Weirs	1.00	EA	$5,000.00	$5,000.00	3.00	EA	$5,000.00	$15,000.00
	7	Security Fence	15,500.00	LF	$14.50	$224,750.00	10,080.00	LF	$14.50	$146,160.00
		Subtotal				$1,456,850.00				$1,705,260.00
		Indirect Cost								
		Engineering / Design (5% of Capital Cost)	1.00	Estimate	$57,682.50	$57,683.00	1.00	Estimate	$85,263.00	$85,263.00
		Construction Management (6%)	1.00	Estimate	$69,219.00	$69,219.00	1.00	Estimate	$102,316.00	$102,316.00
		Subtotal				$126,902.00				$187,579.00
		Total Capital (System Engineering) cost				$1,583,752.00				$1,892,839.00
		Contingency (15%)				$237,563.00				$283,926.00
		Total Present Worth				$1,821,315.00				$2,176,765.00

Recommended TAB II Program Amount

Prepared By: Jack A Frost
Engineering Tech., C.C.E.T.

Check By/: _____
Design Engineer

Filename: (SALPEN99.WK3)

APPENDIX C

ECONOMIC ASSESSMENT

FOR THE

PHASE II, REPORT
DREDGED MATERIAL MANAGEMENT PLAN
UPPER SAGINAW RIVER, MICHIGAN

APPENDIX C
ECONOMIC ASSESSMENT

TABLE OF CONTENTS

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APPENDIX C
ECONOMIC ASSESSMENT

INTRODUCTION

The Saginaw River is formed by the union of the Tittabawassee and Shiawassee Rivers. Saginaw River is 22 miles long and flows northerly into the extreme inner end of Saginaw Bay, Lake Huron. The outer portion of the channel in Saginaw Bay is currently maintained at a depth of 27 feet from Low Water Datum (LWD) and a width of 350 feet for 14 miles; and at a 26-foot depth from LWD with a width of 250-350 feet for 0.4 mile to the mouth of the Saginaw River. The inner channel is maintained at a depth of 25 feet from LWD with a width of 200 feet for 4.5 miles from the mouth of the Saginaw River to the Penn Central Railroad Bridge in Bay City; and at a 22 foot depth from LWD with a width of 200 feet for 13 miles from the Penn Central Railroad in Bay City to the Chesapeake and Ohio Railroad Bridge in Saginaw. The channel limits of the Upper Saginaw River DMMP study are from a point 4.7 miles upstream from the entrance of the Saginaw River to 22 miles upstream from the entrance of the Saginaw River; that is, the 22- through 25-foot deep channel portion of the Federal project.

Within the entire Saginaw River Federal project there are 31 active commercial docks handling a variety of cargo and/or offering services. Eighteen of the thirty-one commercial docks are located within the Dredged Material Management Plan (DMMP) study area. Addendum C-1 lists the dock facilities for the Saginaw River. The commodity facilities handle primarily coal, petroleum, chemicals, fertilizer, potash, salt, grain, and stone. The service facilities offer vessel repair, a mooring station for the U.S. EPA where passenger vessels berth.

BENEFIT INDICATORS

According to the Corps' *Waterborne Commerce of the United States, Part 3 - Waterways and Harbors Great Lakes*, vessel traffic, measured in net tons, has been up and down over the years. Through the 1950's, vessel traffic at Saginaw River averaged just over 4 million net tons annually. Vessel traffic steadily increased in the early 1960's and peaked in 1966 with a net tonnage of 7,243,288 before beginning a decline that lasted through the 1970's and early 1980's. Net tonnage at the River reached a low of 1,608,792 net tons in 1982. The mid to late 1980's saw resurgence in vessel traffic and by 1993 the net tonnage had climbed to 5,234,000. 2001 saw a 15-year high of 5,839,000 short tons.

Vessel traffic for the entire Saginaw River is presented in **Table 1** for the 10-year period of 1991 through 2001, the latest reporting period. The overall tonnage shipped on the Saginaw River has fluctuated but has remained over 5 million tons since 1993 with the exception of 1995 and 2000 where it exceeded 4.5 million tons.

Table 1 Total Tonnage of Saginaw River Tonnage Data, 1991 to 2001 Saginaw Harbor		
Year	**Cargo Tonnage (short tons)**	**% Change**
1991	3,895	
1992	3,789	-2.8%
1993	5,234	32.0%
1994	5,119	-2.2%
1995	4,720	-8.1%
1996	5,264	10.9%
1997	5,730	8.5%
1998	5,609	-2.1%
1999	5,290	-5.9%
2000	4,609	-13.8%
2001	5,829	23.4%

The fluctuations in tonnage and types of cargo are typical for the history of the Saginaw River and are expected to continue with tonnage fluctuating between 4.5 and 6 million short tons annually. The major shipping commodities of the Saginaw River do not follow the trends set by the remainder of the Great Lakes, thus no comparison is attempted in this report. As depicted in **Table 2**, the commodities of the Saginaw River that show increases in tonnage are those of petroleum and petroleum products, clay, slag, non-metallic minerals, cement and concrete. Coal tonnage shows a history of increasing and decreasing every other year. It is assumed that this fluctuation is due to stockpiling. Chemicals and related products have been declining in recent years. Limestone is the largest commodity on the River comprising between 57 and 66 percent of total tonnage in the past 5 years.

A 1991 Detroit District reconnaissance report assessed the feasibility of modifying the existing channel (*Reconnaissance Report Commercial Navigation Modifications Saginaw Bay and River, Michigan*, December 1991). The economic analysis for this Report examined incremental deepening options of 1 to 3 feet. For the analysis, the Saginaw River was divided into three reaches. Reach 1 was the Lower Saginaw River, while Reaches 2 and 3 were subdivisions of the Upper Saginaw River. A 3-year average of vessel traffic for the years 1987 through 1989 was computed using data from the Corps' *Waterborne Commerce of the United States, Part 3 - Waterways and Harbors Great Lakes*. For the Report, three commodity groups were established: Group 1 = coal; Group 2 = stone, nonmetallic minerals, cement, slag, fertilizers, and other; and Group 3 = petroleum products, and basic chemicals and chemical products. The trend in vessel traffic for the Saginaw River can be characterized as stable to modestly increasing.

Table 2
Freight Traffic, comparisons (thousand short tons)
Change in short tons from given year to 2001

Commodity	1996 Grand Total	1998 Grand Total	1999 Grand Total	2000 Grand Total
Total, all commodities	575[1]	230	549	1230
Total coal	-296	32	-228	67
Total petroleum and petroleum products	254	127	136	63
Total chemicals and related products	-67	-63	-47	-29
Total crude materials, inedible except fuels	413	-50	468	1131
Subtotal soil, sand, gravel, rock and stone	-338	-624	104	638
Limestone	186	-406	53	648
Sand & gravel	-524	-212	64	1
Sculpture, clay and salt	624	452	138	240
Slag	127	104	68	67
Other non-metal. Min.	0	18	158	199
Lime, cement and glass	272	186	223	0

[1] This shows that tonnage was 575,000 short tons greater in 2001 than in 1996 for all commodities.

The composition of the fleet servicing the Saginaw River has changed in recent years, as shown in **Table 3**. Many of the commodities are shipped by U.S. Class 5 vessels (600 feet to 649 feet in length). The smallest vessels are Class 1 (under 400 feet in length) while the largest are Class 10 (950 feet to 1,000 feet in length). Canadian vessels are Class 7 (700-730 feet in length). Other foreign vessels, Salties, with an average length of 500 feet, deliver petroleum and chemical products. The Class 1 vessels, some of the Class 2 vessels and the Salties are all powered tankers or barges. Bulk freighters make up the remainder of the vessels.

Docks within the Upper Saginaw River receive coal on Class 5 through Class 10 vessels; stone, nonmetallic minerals, cement, slag, fertilizers on Class 5 and Class 7 vessels; and petroleum, chemical and chemical products on Class 1 and Class 2 vessels, as well as foreign Salties.

The drafts of the inbound and outbound vessels servicing Saginaw Harbor are compared for the years 1996 and 2001 in **Table 3**. Vessels reporting drafts of 23 to 27 feet restricting them to the

Lower Saginaw River are declining in number. Those vessels with drafts of 22 feet or less, and thus capable of using the Upper portion of the project, have been increasing during the past 10 years. Percentage changes in vessels at each draft are presented in **Table 3**. Recent data indicates that the current vessel fleet has shifted dramatically in response to less available draft. The number of vessel trips has increased from 744 in 1996 to 4,172 in 2001. This change is attributed to both the use of smaller vessels and increased shipping.

Table 3

Trips and Drafts of Vessels, Saginaw River, MI

2001	**UPBOUND**						**DOWNBOUND**						
		Self Propelled Vessels			**NonSelf Propelled Vessels**			**Self Propelled Vessels**			**Non-Self Propelled Vessels**		
DRAFT	Total	Passenger & Dry Cargo	Tanker	Tow or Tug	Dry Cargo	Tanker	**Total**	Passenger & Dry Cargo	Tanker	Tow or Tug	Dry Cargo	Tanker	**% Change from 1996**
Foreign & Domestic													
TOTAL	**2057**	**300**	**18**	**886**	**830**	**23**	**2115**	**355**	**18**	**886**	**830**	**26**	
28	-	-	-	-	-	-	**3**	2	-	-	1	-	-57.1%
27	-	-	-	-	-	-	-	-	-	-	-	-	-100.0%
26	**17**	-	-	17	-	-	**26**	9	-	17	-	-	-24.6%
25	-	-	-	-	-	-	**4**	4	-	-	-	-	-88.9%
24	**5**	5	-	-	-	-	**21**	21	-	-	-	-	-39.5%
23	**5**	5	-	-	-	-	**12**	11	-	-	1	-	-72.1%
22	**18**	15	1	2	-	-	**56**	39	8	1	8	-	-30.8%
21	**20**	20	-	-	-	-	**82**	74	1	-	7	-	96.2%
20	**5**	5	-	-	-	-	**113**	88	-	-	25	-	181.0%
19	**42**	36	-	5	-	1	**46**	28	7	5	3	3	183.9%
18	**67**	42	-	5	20	-	**36**	23	1	8	1	3	232.3%
17	**130**	104	-	20	6	-	**70**	48	-	19	2	1	78.6%
16	**35**	34	-	-	1	-	**15**	4	-	-	1	10	-36.7%
15	**32**	15	13	-	4	-	**5**	3	-	-	1	1	42.3%
14	**21**	17	-	4	-	-	**2**	1	-	1	-	-	475.0%
13	**2**	-	-	1	-	1	**2**	-	-	1	-	1	-83.3%
≤12	**1,658**	2	4	832	799	21	**1,622**	-	1	834	780	7	4585.7%
TOTAL TRIPS												**4,172**	
total ≥ 23 ft. draft												**93**	
total ≤ 22 ft. draft												**4,079**	

Table 3, continued

1996	UPBOUND						DOWNBOUND					
		Self Propelled Vessels			NonSelf Propelled Vessels			Self Propelled Vessels			Non-Self Propelled Vessels	
DRAFT	Total	Passenger & Dry Cargo	Tanker	Tow or Tug	Dry Cargo	Tanker	Total	Passenger & Dry Cargo	Tanker	Tow or Tug	Dry Cargo	Tanker
Foreign & Domestic Total	351	**276**	**1**	**46**	**14**	**14**	**393**	**325**	**1**	**35**	**16**	**16**
27	-	-	-	-	-	-	**7**	6	-	-	1	-
26	-	-	-	-	-	-	**55**	55	-	-	-	-
25	-	-	-	-	-	-	**36**	36	-	-	-	-
24	5	-	-	5	-	-	**38**	31	-	5	2	-
23	2	2	-	-	-	-	**23**	16	-	-	7	-
22	18	18	-	-	-	-	**89**	88	-	-	1	-
21	10	10	-	-	-	-	**42**	38	-	-	4	-
20	26	26	-	-	-	-	**16**	16	-	-	-	-
19	25	25	-	-	-	-	**6**	5	1	-	-	-
18	24	21	-	3	-	-	**7**	2	-	3	-	2
17	88	88	-	-	-	-	**24**	23	-	-	-	1
16	62	53	-	-	9	-	**17**	6	-	-	-	11
15	24	24	-	-	-	-	**2**	2	-	-	-	-
14	-	-	-	-	-	-	**4**	1	-	2	-	1
13	14	5	-	9	-	-	**10**	-	-	10	-	-
≤12	53	4	1	29	5	14	**17**	-	-	15	1	1
TOTAL TRIPS												**744**
total ≥ 23 ft. draft												**166**
total ≤ 22 ft. draft												**578**

The benefit indicators for continued maintenance dredging are summarized in Table 4. Large shifts in commodities or tonnage are not expected, but maintaining current levels will become increasingly difficult without dredging. It is expected that, annually, docks along the Saginaw River will handle about 4 - 6 million short tons of cargo over the next ten years (2002-2012). Moreover, the portion of the overall river traffic represented by vessel traffic for the Upper Saginaw River will remain at the current level, about 70% of 5,000,000 net tons for the entire Saginaw River.

TABLE 4
SAGINAW RIVER BENEFIT INDICATORS

Benefit Indicators [1]	Current Operations (2001)	Trend	Summary/ Remarks
Commodity Types	Upper and Lower Saginaw River: 5.3% Coal; 4.9% Petroleum products; 57% Limestone; 10.7% Clay; 5.2% Non-metal; 11.4% Cement; 5.5% Other [2]	Fluctuates, expected range: 4 - 6 million tons annually.	No Change
Tonnage	5 million net tons for Upper and Lower Saginaw River; 3.6 million net tons for Upper Saginaw River only	Steady	No Change
Growth Rates	None	None	No Change
Vessel Types	Bulk	Bulk	No Change
Vessel Sizes	Class 2 - Class 10, Mainly Class 5	Vessel sizes decreasing due to less available draft	Continued lack of dredging will reduce traffic
Vessel Operations	Utilizing maximum channel depths, light load	Steady	No Change

[1] Based on only pertinent indicators.
[2] Based on 2001 vessel traffic from Waterborne Commerce of the United States, Part 3-Great Lakes, Calendar Year 2003.

COST INDICATORS

Dredged materials from both the Upper and Lower portions of the Saginaw River have been placed at various Confined Disposal Facility Sites (CDFs): Skull Island, Middle Ground Island, and Saginaw Bay Island. As shown in **Table 5**, the Skull Island CDF was first used in 1971, and it was quickly filled to capacity. The Middle Ground Island CDF was last used in 1984. The CDF supplied material as a daily cover for a landfill adjacent to the CDF until the landfill was filled in 1984. The Saginaw Bay Island CDF was constructed and first used for disposal of dredged material in 1978. As constructed, the CDF has a maximum capacity to hold 10,000,000 cubic yards of dredged material. Since 1984, all dredged material from the Saginaw River has been placed in the Saginaw Bay Island CDF. Material from the Upper Saginaw was placed in this CDF through 1995 on an emergency basis only and it has not been dredged since 1995. This is reflected in the change in vessels using the river. It was necessary to decrease vessel size to continue shipment. The proposed plan for providing future disposal capacity for the Upper Saginaw River is to develop the Zilwaukee Township Site, West of Saginaw River. This alternative was the least costly and most environmentally acceptable of the available alternatives. Therefore, for this analysis, historic and current, as well as projected future costs associated with the Saginaw Bay Island CDF, will be compared to identify the trend in project costs, bringing all costs to 2004 dollars.

In 1978, maintenance-dredging costs were $10.19 per cubic yard, after being adjusted to 2004 dollars (see **Table 5**). The most recent dredging occurred in 2001 at a cost of $10.44 per cubic yard in 2004 dollars. Historical dredging costs in 2004 dollars resulted in recent costs averaging between $5 and $7. The new CDF proposed in this report is expected to decrease annual costs

TABLE 5
SAGINAW RIVER
CHANNEL MAINTENANCE DREDGING COST HISTORY
USING EXISTING SAGINAW CDF

Year	Cubic Yards	Total Cost	Cost/Cubic yd	Cost/Cubic Yd. in 2004 dollars**	Placement Area	Contractor or Government
1971	48,461	$112,647	$2.32	$10.19	Skull Island CDF	Government
1972	86,994	$280,479	$3.22	$12.76	Skull Island CDF	Government
1973	109,206	$192,002	$1.76	$6.45	Middle Ground CDF	Government
1974	138,540	$250,877	$1.81	$6.22	Middle Ground CDF	Government
1975	156,271	$410,324	$2.63	$8.26	Middle Ground CDF	Government
1976	91,733	$461,133	$5.03	$14.55	Middle Ground CDF	Government
1978*	2,362,680	$5,248,835	$2.22	$5.56	Bay CDF/ Middle Ground CDF	Contractor/ Government
1979*	393,645	$857,043	$2.18	$5.04	Bay CDF	Government
1980*	891,366	$1,436,748	$1.61	$3.45	Bay CDF	Government
1981*	677,284	$1,755,095	$2.59	$5.09	Bay CDF	Government
1982*	642,844	$1,482,013	$2.31	$4.19	Bay CDF	Government
1983*	909,732	$1,648,045	$1.81	$3.09	Bay CDF	Government
1984*	902,748	$4,545,147	$5.03	$8.43	Bay CDF	Contractor
1985	365,275	$2,162,575	$5.92	$9.80	Bay CDF	Contractor
1986-1987*	517,324	$2,086,167	$4.03	$6.43	Bay CDF	Contractor
1988-1989	346,169	$2,091,892	$6.04	$9.19	Bay CDF	Contractor
1990	345,409	$1,639,719	$4.75	$6.97	Bay CDF	Contractor
1991	771,705	$2,314,471	$3.00	$4.31	Bay CDF	Contractor
1992-1994	904,878	$3,463,605	$3.83	$5.12	Bay CDF	Contractor
1995	218,500	$2,379,000	$6.31	$8.01	Bay CDF	Contractor
1996	164,772	$477,905	$2.90	$3.58	Bay CDF	Contractor
1997	235,949	$910,147	$3.86	$4.60	Bay CDF	Contractor
1998	142,765	$1,023,171	$7.17	$8.41	Bay CDF	Contractor
1999	376,136	$756,988	$2.01	$2.31	Bay CDF	Contractor
2000	184,987	$1,429,354	$7.73	$8.63	Bay CDF	Contractor
2001	44,861	$427,927	$9.54	$10.44	Bay CDF	Contractor
Total	12,030,234	$39,843,309	$3.31			
10-yr avg (1991-2001)	338,284	$1,464,730	$4.33	$6.16		
5-yr avg (1991-1996)	514,964	$2,158,745	$4.19	$5.26		
5-yr avg (1997-2001)	196,940	909,517	$4.62	$6.88		

* Cubic yards combined due to multiple times dredged in one year.
**Costs adjusted using the Engineering News Record Construction Cost Index (ENR CCI)

due to the significant decrease in the distance necessary to disposed of the dredged material, a decrease of as much as 24 miles.

The total annual cost to maintain the authorized channel includes the annual cost to dredge the material as discussed above and the annual capital investment cost of the proposed CDF.

The proposed plan for the CDF at the Zilwaukee Township Site, West of Saginaw River would meet the 20-year capacity requirement of 3,100,000 total cubic yards (150,000 cubic yards per year). Total Construction and Average Annual Costs presented in **Table 6**.

Table 6
COSTS
Saginaw CDF, West

	Engineer's Estimate				
Component	Quantity	Unit	Unit Price	Cost	Subtotal
Capital Cost					
Mobilization/Demobilization	1	Each	$50,000.00	$50,000	
Clearing and Grubbing	8	Acres	$2,500.00	$20,000	
Stripping Unsuitable Material	145,000	CY	$2.25	$326,250	
Excavate Clay	119,000	CY	$1.45	$172,550	
Construct New Dikes	119,000	CY	$2.90	$345,100	
Install Weirs	3	Each	$5,000.00	$15,000	
Security Fence	15,500	LF	$14.50	$224,750	
Subtotal				$1,153,650	
Subtotal Capital					$1,153,650
INDIRECT Cost					
Engineering/Design (5% of Capital Cost)	1	Estimate	$57,683	$57,683	
Construction Management (6%)	1	Estimate	$69,219	$69,219	
Subtotal					$126,902
Total Capital (System, Engineering) Cost					$1,280,552
Contingency (15%)					$192,082.73
Total Project Cost					**$1,472,634**
Average Annual Cost*					**$124,510**
*20-year AAC based on current interest rate of 5.625%					

Amortizing the new CDF construction cost over 20 years results in an average annual cost of $124,510. Future annual dredging cost are expected to be less than the recent averages due to the decrease in the distance required to transport the dredged material. A forecast for future dredging

expenses is not possible since dredging costs fluctuate dramatically on a year-to-year basis and the analyzing the factors affecting those costs (transportation costs, fuel costs, shipping costs) are beyond the scope of this analysis. Based on the recent averages presented in **Table 5** and the knowledge that future costs will decrease, the future annual cost of dredging is assumed to be $5.00 per cubic yard. It is expected that approximately 300,000 cubic yards of dredged material will be removed and at an average cost of $5.00 per cubic yard resulting in expected annual dredging costs of $1,500,000. Thus, at 2004 price levels, the total future annual cost of the CDF construction and dredging is $124,510 (average annual cost of the constructed CDF) plus $1,500,000 or $1,624,510.

The total annual project maintenance costs for years after the construction of the proposed project are summarized in **Table 7**. After adjusting for price level changes, future annual project maintenance costs are expected to be low relative to previous years. This decrease is primarily due to the significantly lower annualized construction costs of the proposed CDF as opposed to the existing CDF. Additional savings occur resulting from the dredging cost savings attributable to the decrease in distance between the CDF from the dredging site.

Table 7
Saginaw River
Total Annual Project Maintenance Cost for Select Years and for Proposed Project
in 2004 dollars

	Dredging	**Annual Cost of CDF***	**Total Annual Cost**
1978	$13,128,232	$617,576	$13,745,808
1981	$3,446,303	$617,576	$4,063,878
1986-87	$3,328,675	$617,576	$3,946,251
1991	$3,325,434	$617,576	$3,943,010
1996	$477,905	$617,576	$1,095,481
2004 +	$1,500,000	$124,510	$1,624,510

* Existing CDF was constructed at a 1978 cost of $2,919,628. This cost was adjusted to 2004 dollars using the ENR CCI and amortized over 20 years using the current interest rate of 5.625% for 1978 -1996, see **Table 6** for the future project annual cost calculation.

ECONOMIC JUSTIFICATION

Table 3 presents the vessel traffic for 1996 and 2001 indicating significant increases in vessel traffic. Table 1 indicates that tonnage is relatively stable to moderately increasing. Table 7 presents historical annual costs and expected future costs of the project. In summary, both tonnage and traffic are increasing and annual costs of maintenance will decrease with the construction of the proposed CDF. Based on the benefits and costs review in this analysis, continued maintenance dredging of the authorized channel is economically justified.

ADDENDUM C-1

DOCK FACILITIES

SAGINAW RIVER
MICHIGAN

ADDENDUM C-1, DOCK FACILITIES FOR SAGINAW RIVER

NAME	LOCATION	PURPOSE
Amoco Oil Co., Bay City Terminal Wharf.	Lft bank, on lower side of slip approx. 1.8 mls above mouth	Occasional receipt of petroleum products.
Bay Aggregate, Bay City Wharf.	Rt bank, approx. 700 ft above Veterans Memorial Bridge	Receipt of stone by self-unloading vessel.
Bay Aggregate, I.B. Industrial Park Wharf.	Rt bank, approx. 0.3 mls above Veterans Memorial Bridge	Receipt of stone by self-unloading vessel.
Bay Dock Co., Wirt Saginaw Stone Wharf.	Rt bank, approx. 0.5 mls above I-75 Bridge	Receipt of stone, sand, salt, potash and coal by self-unloading vessel; shipment of stone by barge.
Burroughs Materials Corp., Saginaw Terminal Wharf.	Lft bank, approx. 0.9 mls below I-75 Bridge	Receipt of miscellaneous dry bulk commodities by self-unloading vessel, including stone
Carrollton Concrete Mix Dock.	Lft bank, below CSX Transportation bridge	Receipt of stone by self-unloading vessel.
Carrollton Paving Co., Essexville Dock.	Rt bank, approx. 0.7 mls below Lake State Railway bridge.	Occasional receipt of limestone by self-unloading vessel.
City of Bay City, Parcel No. 10 Dock.	Rt bank, approx. 0.3 mls below Lafayette Bridge	Not used.
City of Bay City, Parcel No. 9 Dock.	Rt bank, approx. 0.5 mls below Lafayette Bridge	Not used.
City of Bay City, Wenonah Park Wharf.	Rt bank, below Veterans Memorial Bridge	Mooring U.S. Environmental Protection Agency vessels; occasional landing of passengers from excursion vessels and mooring of vessels on exhibition; mooring miscellaneous small craft.
Consumers Power Co., Essexville Wharf.	Rt bank, at mouth	
Countrymark Cooperative, Saginaw Grain Terminal Wharf.	Lft bank, approx. 1.1 mls above I-75 Bridge	Receipt of coal by self-unloading vessel for plant consumption.
DowBrands L.P., Bay City Seaway Terminal Wharf.	Lft bank, approx. 0.3 mls below Lake State Railway bridge	Occasional shipment of grain.
ESSROC Materials Inc., Aetna Cement Wharf.	Rt bank, approx. 0.8 mls below Lake State Railway bridge	Receipt of calcium chloride by barge; occasional receipt of liquid UAN fertilizer by vessel.
Fletcher Marine Terminal, Ship Wharf.	Lft bank, approx. 0.3 mls below Central MI Railway bridge	Receipt of cement clinker and occasional receipt of limestone by self-unloading vessel.
Fletcher Marine Terminal, Tugboat Wharf.	Lft bank, approx. 0.4 mls below Central MI Railway bridge	Not used. (See Remarks)
General Motors Corp., Saginaw Grey Iron Plant Wharf.	Rt bank, approx. 1.4 mls below CSX Transportation bridge	Mooring tugboat and other small craft.
International Materials, Saginaw First Street Dock.	Rt bank, approx. 0.7 mls below CSX Transportation bridge	Not used.

ADDENDUM C-1, DOCK FACILITIES FOR SAGINAW RIVER

NAME	LOCATION	PURPOSE
Lafarge Corp., Carrollton Sixth Street Wharf.	Lft bank, approx. 1.0 mls below CSX Transportation bridge	Receipt of miscellaneous dry bulk commodities by self-unloading vessel, including stone.
Luntz Corp. Wharf.	Lft bank, approx. 1.1 mls below CSX Transportation bridge	Receipt of bulk cement by self-unloading vessel.
Peavey Co., Carrollton Elevator Wharf.	Lft bank, approx. 0.8 mls below CSX Transportation bridge	Not used.
Saginaw Asphalt Paving Co., Buena Vista Dock.	Rt bank, approx. 0.2 mls above I-75 Bridge	Shipment of grain.
Saginaw Asphalt Paving Co., Carrollton Dock.	Lft bank, approx. 0.7 mls below CSX Transportation bridge	Receipt of miscellaneous dry bulk commodities by self-unloading vessel, including stone, sand, and salt.
Saginaw Rock Products Co., Busch Marine Dock.	Lft bank, approx. 1.0 mls above I-75 Bridge	Receipt of miscellaneous dry bulk commodities by self-unloading vessel, including stone, sand, coal, and salt.
Saginaw Rock Products Co., Saginaw Dock.	Rt bank, approx. 0.4 mls below CSX Transportation bridge	Mooring company-owned tugboat and floating equipment.
Saginaw Valley Marine Terminal Wharf.	Rt bank, Main Channel, approx. 1.0 mls above Lafayette Bridge	Receipt of miscellaneous dry bulk commodities by self-unloading vessel, including stone and coal.
Sand & Stone Dock.	Rt bank, approx. 0.3 mls below Lake State Railway bridge	Occasional receipt and shipment of conventional general cargo.
Sargent Docks & Terminal Co., Zilwaukee Wharf.	Lft bank, approx. 0.2 mls below I-75 Bridge	Receipt of miscellaneous dry bulk commodities by self-unloading vessel, including limestone and potash and other fertilizers.
Total Petroleum, Bay City Terminal Wharf.	Lft bank, approx. 0.3 mls above Lake State Railway bridge	Receipt of miscellaneous dry bulk commodities by self-unloading vessel, including salt, coal, fertilizer and stone.
Triple Clean Liquifuels Wharf.	Rt bank, approx. 800 ft below Lake State Railway bridge	Receipt and shipment of petroleum products.
U.S. Army, Corps of Engineers, Saginaw Area Projects Office Wharf	Rt bank, lower side of inner end of slip, approx. 1.4 mls above river mouth	Receipt of petroleum products.
U.S. Coast Guard, Saginaw River Station Wharf.	Rt bank, upper side of inner end of slip, approx. 1.4 mls above river mouth	Mooring and fueling government-owned vessels.
Valley Asphalt Co. Dock.	Lft bank, approx. 0.3 mls below CSX Transportation bridge	Mooring, fueling and servicing U.S. Coast Guard vessels.

ADDENDUM C-1, DOCK FACILITIES FOR SAGINAW RIVER

NAME	LOCATION	PURPOSE
William W. Stender, Lower Wharf Mooring.	Lft bank, Main Channel, approx. 1.2 mls above Lafayette Bridge	Receipt of stone and sand by self-unloading vessel.
William W. Stender, Upper Wharf and Moorings.	Lft bank, Main Channel, approx. 1.3 mls above Lafayette Bridge	Mooring company-owned floating equipment.
Wirt Overseas Blending and Transfer Co. Wharf.	Rt bank, approx. 0.2 mls below Lake State Railway bridge	Mooring vessels for repair; mooring company-owned floating equipment.
Wirt Transport Co., Bay City Stone Dock.	Lft bank, approx. 350 ft above Independence Bridge	Occasional receipt of miscellaneous dry bulk commodities by self-unloading vessel, including fertilizer and cement clinker. (See Remarks) Receipt of stone, coal, and salt by self-unloading vessel, and occasional shipment of stone by barge.

APPENDIX D

REAL ESTATE PLAN
FOR THE

PHASE II, REPORT
DREDGED MATERIAL MANAGEMENT PLAN
UPPER SAGINAW RIVER, MICHIGAN

APPENDIX D

REAL ESTATE PLAN
DREDGED MATERIAL MANAGEMENT PLAN
UPPER SAGINAW RIVER, MICHIGAN

AUTHORITY

The Upper Saginaw River Dredged Material Management Plan (DMMP) is conducted under the guidance of the National Harbors Program: Dredged Material Management Plan dated July 21, 1994 (EC1165-2-200). The purpose of the DMMP is to determine the location and suitability of dredged material placement sites that satisfy the 20-year future dredge disposal needs of the upper portion of the Saginaw River federal navigation project. An approved DMMP will provide the approval needed to continue design of the Dredge Material Disposal Facility (DMDF) leading in construction of the facility in fiscal year 2005.

The Saginaw River Navigation Project is authorized by the Rivers and Harbors Acts of 1910, 1930, 1937, 1938, 1954, 1962, and 1965. The non-federal sponsor is required by the Water Resources Development Act of 1986, as amended (33 USC 2211) to provide the land needed for construction of the DMDF

The Real Estate Plan (REP) addresses the Detroit District Corps of Engineers' and the non-federal sponsor's plan to construct a DMDF for placement of dredged material from the upper portions of the Saginaw River, Michigan federal navigation project (Alternative 1). The navigation project consists of a 36-mile navigation channel ranging in depth from 27 to 16.5 feet. The upper portion of the project is 18 miles long and ranges in depth from 22 to 16.5 feet. The REP describes the lands, easements, relocations and disposals areas (LERRD's) required for the construction, operation and maintenance of the DMDF project.

LOCATION

The Saginaw River is located in Saginaw and Bay counties, Michigan. The location of the DMDF is located northeast of the City of Saginaw, a city of 70,000 residents, and south of Bay City, a city of 39,000 residents. Both cities are county seats. They are located approximately 110 miles north of Detroit, Michigan.

The 281-acre DMDF site is located in both Saginaw and Bay counties. The location is a rural area with many farms. Electricity is readily available, but the rural residences rely on water wells and septic systems. Natural gas is available in limited areas.

The Saginaw area, however, has major tourism and manufacturing industries. General Motors Corporation and Delphi Corporation, a major automobile supplier, have four major manufacturing complexes in the area. The area's location on Lake Huron makes it a major destination for hunting, fishing, and water sports.

PROJECT PURPOSE AND DESCRIPTION

The purpose of the DMDF is to provide for 20 years of capacity for annual dredging of the upper Saginaw River. This requires construction of a facility capable of containing 3,100,000 CY of material. The site is currently diked, because it is located on reclaimed agricultural land. The DMDF requires construction of new offset dikes, which are higher and wider than the existing dikes. In addition, interior dikes will divide the facility into cells. Filling and capping of each cell will occur separately in order to minimize the exposure of wildlife to the dredged material while allowing rapid establishment of vegetation. The facility, also, has a weir to address site effluent. See figure 5 for overall Site Plan.

PROJECT LANDS

Two private owners own the site. The non-federal sponsor, Saginaw County, has initiated preliminary discussions with the owners, who indicate they are willing to convey the site to the County. The property is neither owned by the federal government nor been provided for in another federal project. It, also, is not subject to the navigation servitude. No present or anticipated mineral activity is within site. There are no cemeteries or public facilities requiring relocation. Initial plans and specifications do not identify any relocation of public utilities or roadways. There will be no displacement of persons or businesses.

The State of Michigan Department of Environmental Quality(MDEQ) has identified the DMDF site as a wetland requiring mitigation. The draft Environmental Assessment (EA), however, states the site is not a wetland under federal standards, because it has already been converted to farmland. The non-federal sponsor has agreed to provide 300 acres of wetland mitigation on adjacent land, as required by the MDEQ. The owners of the DMDF site own this land. This mitigation land is not a project feature and is not included in the land needed for the project.

There are no historic properties within the proposed DMDF site. An archeological survey, conducted at the request of the State Historic Preservation Office (SHPO), has revealed two archeological sites on adjacent land, which are potentially eligible for inclusion on the National Register of Historic Places.

ESTATES

The minimum estate, which the non-federal sponsor must possess, is fee (281 acres). The fee area is anticipated to provide sufficient work areas for construction. Thus, temporary work area easements are not anticipated.

VALUE OF LANDS, RELOCATIONS, AND DISPOSAL AREAS

The estimate value of the lands, relocations, and disposal areas required for the DMDF project is $757,000.00. This amount is determined by a gross appraisal dated March 21, 2005.

ENVIRONMENTAL

As required by the National Environmental Policy Act of 1969 (NEPA), the Corps of Engineers will assessed the environmental impacts of the project. As part of this assessment, coordination occurred with the State Historic Preservation Office (SHPO) to determined if properties listed on the National Register of Historic Places are within the area of potential impact. During consultation, the Corps agreed to conduct an archeological survey. The survey identified two potentially eligible archeological sites adjacent to the DMDF site. The SHPO reviewed the proposed DMDF project and found the project would not have an adverse impact on these archeological sites.

An HTRW investigation was, also, performed on the site. It found no evidence of contaminants impacting human health or the environment. (See Environmental Assessment, section 5-11, page EA-6)

In addition, the DMDF project was evaluated under the following acts, as amended: Fish and Wildlife Act of 1956, Fish and Wildlife Coordination Act of 1958, National Historic Preservation Act (NHPA), Michigan Coastal Zone Management Act of 1972, Endangered Species Act of 1973, Water Resources Development Act of 1976, Clean Water Act of 1977, Clean Air Act, and Executive Orders 11988 and 11990. The evaluation concluded the proposed project would not cause significant adverse impacts on the human environment or environmental resources in the project area and the surrounding area.

NON-FEDERAL SPONSOR IDENTIFICATION

The County of Saginaw, Michigan is the non-federal sponsor for the DMDF project. The County will provide local cooperation as required by the Project Cooperation Agreement (PCA) and participate in project design.

The County has the full power, authority and capability to provide the items of local cooperation. It, also, has the legal capability to provide its share of total project costs. Finally, the County has the capability to complete its portion of the project within the designated time frames.

The County is capable of providing all required LERRDs necessary for project construction, operation and maintenance. The County is a legally constituted public body with the full power, authority, and capability to perform of the terms of the PCA. It has the power of eminent domain. Its legal department is fully capable of handling acquisitions and condemnations. Requirements of PL 91-646, acquisition policies and procedures, LERRD crediting procedures, and the requirements for land acquisition have been discussed with the sponsor. See enclosed Exhibit A, Assessment of Non-Federal Sponsor's Real Estate Acquisition Capability.

REAL ESTATE MANAGEMENT PLAN

Real Estate Division will further assess real estate requirements for the recommended plan, as well as, provide detailed information regarding LERRD's identified as necessary for the DMDF project. In addition, Real Estate Division will coordinate, monitor, and assist with all acquisition activities undertaken by the non-federal sponsor. This will assure that the acquisition process complies with Federal and State laws specifically the requirements under the Federal Uniform

Relocation and Acquisition Act (P.L. 91-646). Real Estate Division will also attend district team meetings, review and provide input into draft and final reports prepared by the project delivery team, and participate in the ITR.

The non-federal sponsor has been given detailed information regarding the requirements for LERRD's necessary for completion of the Project and fully anticipates meeting the current District schedule. The Real Estate Division will monitor and assist the sponsor with all acquisition activities undertaken. This assures that the conduct of the acquisition process complies with Federal and State laws.

REAL ESTATE COST ESTIMATE

Federal Administrative costs	$37,600
Non-Federal Sponsor costs	
a. LERRD's value	757,000
b. Administrative	10,000
Total	$804,600

EXHIBIT "A"

DETROIT DISTRICT REAL ESTATE
ASSESSMENT OF NON-FEDERAL SPONSOR
REAL ESTATE ACQUISITION CAPABILITY

PROJECT: Dredged Material Management Plan Upper Saginaw River, Michigan

I. LEGAL AUTHORITY

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes?

(Yes/No)

Initials DCE___ Date _5/18/04

b. Does the sponsor have the power of eminent domain for this project?

(Yes/No)

Initials _DCE _ Date_5/18/04 ___

c. Does the sponsor have "quicktake" authority for this project?

(Yes/No)

Initials_DCE_____ Date 5/18/04_

d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundaries? *A portion of the land is located in Bay County and the non-federal sponsor is Saginaw County.*

(Yes/No)

Initials DCE__ Date_5/18/04_

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn?
(Yes/No)

Initials DCE____ Date 5/18/04

II. HUMAN RESOURCE REQUIREMENTS

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended?

(Yes/No)

Initials DCE__ Date 5/18/04___

b. If the answer to II.a. is "yes", has a reasonable plan been developed to provide such training?

N/A

Initials DCE__ Date 5/18/04___

c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project?

(Yes/No)

Initials DCE__ Date 5/18/04___

d. Is the sponsor projected in-house staffing levels sufficient considering its other workload, if any, and the project schedule?

(Yes/No)

Initials DCE__ Date 5/18/04___

e. Can the sponsor obtain contractor support, if required in a timely fashion?

(Yes/No)

Initials DCE__ Date 5/18/04___

f. Will the sponsor likely request USACE assistance in acquiring real estate?

(Yes/No)

Initials DCE__ Date 5/18/04___

III. OTHER PROJECT VARIABLES

a. Will the sponsor's staff be located within reasonable proximity to the project site?

(Yes/No)

Initials DCE__ Date 5/18/04___

b. Has the sponsor approved the project/real estate schedule/milestones?

(Yes/No)

Initials DCE__ Date 5/18/04___

c. Has the sponsor performed satisfactorily on other USACE projects?
(yes/no/not applicable)

Initials DCE__ Date 5/18/04___

d. With regard to this project, the sponsor is anticipated to be: highly capable /
capable/moderately capable/marginally capable/insufficiently capable. (If the sponsor
believed to be insufficiently capable, provide explanation.)

Initials_DCE_ Date_5/18/04_

Prepared by:

/S/ DON C. ERWIN
Signature

Chief, Acquisition Branch
Title

Reviewed and approved by:

/S/ VICTOR L. KOTWICKI
Signature
Chief, Real Estate Division
Title

APPENDIX E

CORRESPONDENCE

FOR THE

DREDGED MATERIAL MANAGEMENT PLAN
UPPER SAGINAW RIVER, MICHIGAN

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

November 12, 1999

IN REPLY REFER TO:

Programs and Project Management

Mr. Larry Witte
Chief, Land and Water Management Division
Michigan Department of Environmental Quality
P.O. Box 30028
Lansing, Michigan 48909

Dear Mr. Witte:

I am writing to inform you that we are terminating the study of a confined disposal facility (CDF) for the Upper Saginaw River under the authority of Section 123, Public Law 91-611. We base this decision on the long-term decline in the level of PCB contaminants in the material to be dredged from this area.

Our thanks go to you, Mr. Hal Harrington, and staff throughout the old MDNR for your cooperation on this project over the years. We look forward to continue working cooperatively with your staff in reaching a solution to managing dredged material from the Upper Saginaw River.

Any such solution requires a placement area, if only as a transfer site for beneficial use. The State of Michigan is the local sponsor of navigation improvements in the Saginaw River. As such, the State took responsibility for providing, without cost to the United States, suitable areas required for placement of dredged material. Since 1978, PL 91-611 has provided substantial Federal investment to satisfy this responsibility at no cost to the State. Material from the Upper Saginaw required confinement because of the level of PCBs in it. The material was transported an average distance of about 17 miles to the Bay CDF. A graph of the declining PCB levels is enclosed. The Upper Saginaw is roughly the portion of the graph where channel distance from the bay exceeds 30,000 feet. Now that we have determined that the material from the Upper Saginaw no longer needs confinement, effective management practice dictates that we reserve the limited space available in the Bay CDF for material from the Lower Saginaw.

A placement site located closer to dredging operations in the Upper Saginaw would save us most of the cost we now incur to transport the material. In order to secure a nearby placement area, we committed significant resources to plan and engineer a CDF for the Upper Saginaw under PL 91-611 authority. However, once the level of contaminants in the dredged material declined to the point where confinement was no longer necessary, PL 91-611

Enclosure 3

authority no longer applied to the Upper Saginaw. Based on legislation authorizing construction and maintenance of the channel, the responsibility for identifying a suitable placement area for the Upper Saginaw reverted to the local sponsor.

Typically, the Corps contracts nearly $1 million every two to three years for maintenance dredging in the Upper Saginaw River. This expenditure covers dredging and transporting the material to the CDF in Saginaw Bay. A more cost effective placement area appears to be available at a site situated near the dredging activity in the Upper Saginaw River, in the proximity of the Zilwaukee Bridge. Use of this or a comparable site would substantially reduce the cost of our maintenance dredging operations in the Upper Saginaw River. We last dredged in both the Lower and Upper Saginaw River in 1995. Due to the greater haul distance, the cost to dredge the Upper Saginaw was $3.50 per cubic yard more than the cost to dredge the Lower Saginaw. In addition, the space in the CDF also has a value.

In this era of constrained budgets, our operations and maintenance practices must continually demonstrate sound economic decision making. The status quo of using the Bay CDF for disposal of material dredged from the Upper Saginaw, all at full Federal expense, may be unacceptable. We are examining our options. Among these options is the possibility that we will no longer accepting material from the Upper Saginaw at the Bay CDF.

The Michigan Department of Natural Resources reorganized in 1995. We assume that your office now acts for the State of Michigan as the local sponsor for this project. Our point of contact for this issue is Mr. Joe Mantey at (313) 226-3445. Your designee should contact him to discuss our requirements and associated responsibilities.

Sincerely,

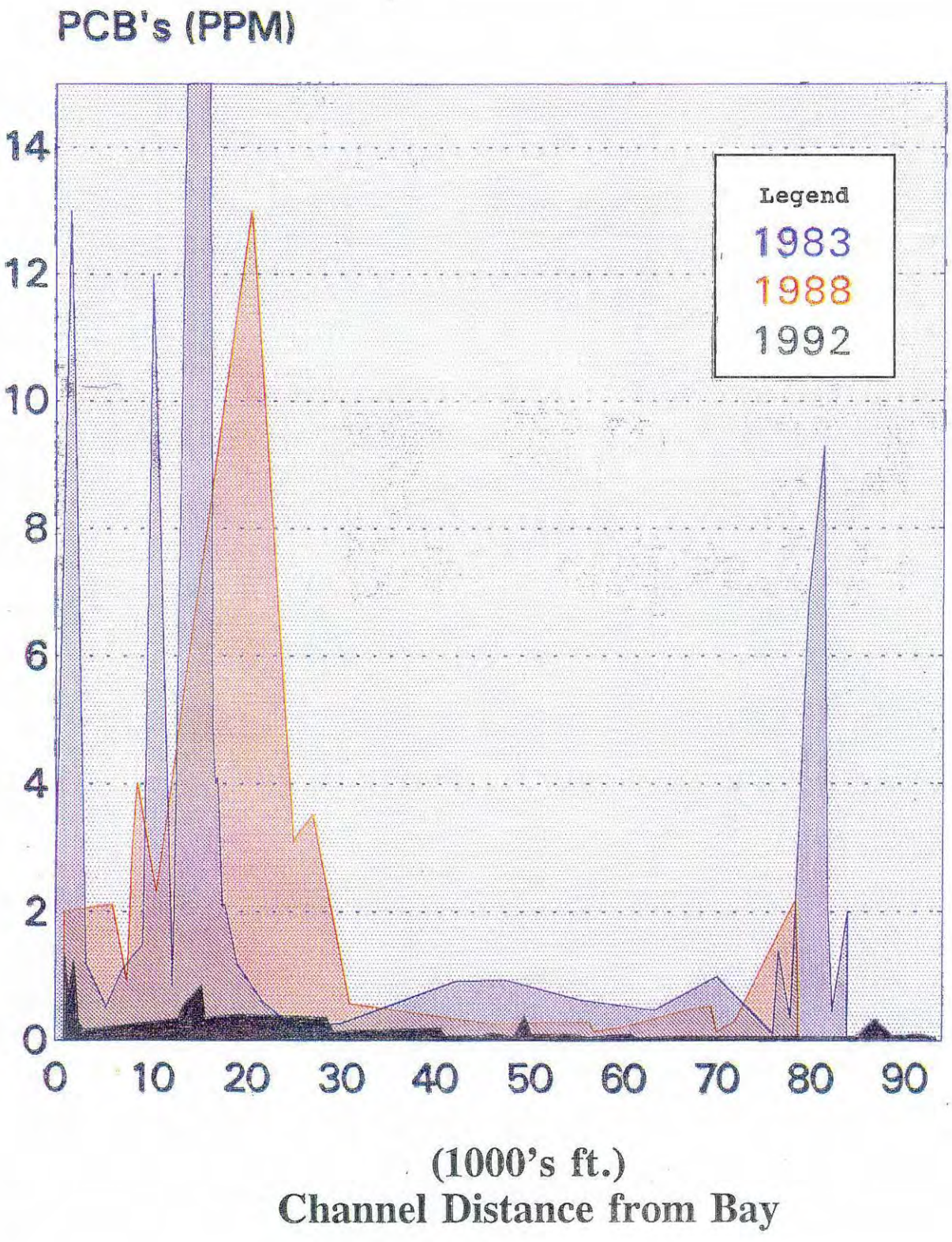
W. Scott Parker, P.E.
Ch, Programs & Project Management

Copies Furnished:

Mr. Larry Karnes, MDOT, P.O. Box 30050, Lansing, MI 48909
Mr. Thomas Hickner, County Executive, Bay County, 515 Center Ave., Bay City, MI 48708
Mr. William Wright, Saginaw Co. Planning Director, 111 S. Michigan Ave., Saginaw, MI 48602
Mr. Charles Wooley, USFWS, East Lansing Field Office, 2651 Coolidge Rd., East Lansing, MI 48823

Declining PCB Levels

Saginaw River Channel, MI



STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

"Better Service for a Better Environment"

HOLLISTER BUILDING, PO BOX 30473, LANSING MI 48909-7973

INTERNET: www.deq.state.mi.us

RUSSELL J. HARDING, Director

June 21, 2000

Lieutenant Colonel Robert Davis
District Engineer
U.S. Army Corps of Engineers, Detroit District
P.O. Box 1027
Detroit, MI 48231-1027

Dear Colonel Davis:

The lower water levels in the Saginaw Bay and the Saginaw River have reduced the effective drafts of freighters delivering products to the upper Saginaw River. The restricted navigational depths in the federal channel are having an adverse economic impact on Bay and Saginaw Counties and the surrounding communities. This situation will continue to deteriorate in coming years with the continued failure to maintain the river channel.

The state of Michigan, the county of Bay, and the county of Saginaw request that you prepare a dredge material management plan (DMMP) to assist in determining the feasibility of siting and constructing a confined disposal facility (CDF) for the upper Saginaw River. We would prefer that the CDF not impact any wetlands, if possible. Impacts resulting in a loss of floodwater storage capacity should be identified for potential sites that are located in flood prone areas. The DMMP should also look at a "no action" alternative to determine if it is economically viable to create a CDF for the continued maintenance of the upper Saginaw River.

The state of Michigan, the county of Bay, and the county of Saginaw are identified as the local sponsors for the requested DMMP. It is our understanding that this phase is at no cost to the local sponsors. Following the DMMP's completion, the determination will be made to continue with implementation, terminate the program, or explore other alternatives.

Ch, ETS ____
↑
Action

Need a fairly lengthy letter that lays out the situation and the responsibilities of all parties and the specific difficulties we've experienced on this action over the past few years

CC: DPM

QP 0100e
Rev. 1/98)

Your assistance in this matter is appreciated. If you have any questions, require further information, or desire a meeting, please contact Mr. Richard A. Powers, Chief, Land and Water Management Division, Michigan Department of Environmental Quality (MDEQ), at 517-373-1170, or you may contact me.

Sincerely,

Russell J. Harding
Director
517-373-7917

cc: U.S. Representative James Barcia
Senator Joel Gougeon
Representative A.T. Frank
Representative Joseph Rivet
Mr. Thomas L. Hickner, Bay County Executive
Mr. M. McGill, Saginaw County Executive
Mr. Edward Rivet, Chair, Bay County Board of Commissioners
Mr. Robert Fish, Chair, Saginaw County Board of Commissioners
Ms. LeAnne G. Wilson, Governor's Washington Office
Mr. Bryan Roosa, Governor's Washington Office
Mr. Matt Hare, Governor's Office
Mr. K. L. Cool, Director, MDNR
Mr. James R. DeSana, Director, MDOT
Mr. Arthur R. Nash Jr., Deputy Director, MDEQ
Mr. Bryan A. Harrison, Acting Legislative Liaison, MDEQ
Mr. Richard A. Powers, MDEQ

July 13, 2000

Planning, Programs & Project Management Division

Mr. Russell J. Harding
Director
Department of Environmental Quality
P.O. Box 30473
Lansing, Michigan 48909-7973

Dear Mr. Harding:

Thank you for your letter of June 21, 2000, requesting us to initiate a Dredged Material Management Plan(DMMP) for the Upper Saginaw River.

We are prepared to initiate the effort for the DMMP study this fiscal year. This study is conducted under the guidance of the National Harbors Program, (EC1165-2-200). The purpose of this study is to determine if additional suitable dredged material placement sites/options are available in the vicinity of the Upper Saginaw River, that will satisfy future dredging requirements over a 20-year planning period. The feasibility document will: (a) review studies that have been conducted to date; (b) provide an economic assessment to justify continued maintenance dredging; (c) discuss potential options that appear viable for disposal of dredged material including "no action"; and (d) determine the "Base Plan" (Federal Standard) that will establish the Federal/Non-Federal implementation cost share. The Federal Standard is based on one potential solution that is engineeringly feasible, least costly, and environmentally acceptable. The Feasibility Phase of the DMMP study is 100% Federally funded.

In regards to the placement of the dredged material, the quality of the dredged material in the Upper Saginaw River has improved over the years, such that the placement classification of dredged materials has changed to, *Upland Unconfined,* and therefore a Confined Disposal Facility (CDF) may no longer be considered. The term Dredged Material Placement Site (DMPS) will be used, which refers to any site where dredge material is placed, often temporarily to dewater, that does not require strict confinement.

Based on updated data from the Upper Saginaw River Letter Report (May 1993), we anticipate the 20-year requirement to include, permit dredging (400,000 cy), backlog dredging (700,000 cy,1991 estimate), and annual maintenance dredging (2,000,000 cy) for a total of 3,100,000 cy. If the dredged material is not reused for beneficial purposes, then a site of approximately 400 acres will be needed to hold the dredged material. If beneficial uses can be

developed for the dredged material, then the size of site can be reduced.

The following is a list significant factors that were used in prior studies to evaluate alternatives and will be critical factors in the current evaluation; (1) the site should not to be in the flood plain, (2) the site cannot be a HTRW site, (3) the site must be within a mile, where practical, of the navigation channel and have access for a pipeline to the navigation channel, in order to hydraulically place material, (4) preferably, the site has minimal impacts to wetlands or wetland free, and (5) the site should be archeologically acceptable, in other words, the site will require an archeological survey, unless it has already been conducted and no artifacts have been found.

As you are aware the local sponsor will be responsible for providing, all lands, easements and right-of way for the DMPS. Therefore, we would expect the State, Bay County and Saginaw County to identify potential upland sites for consideration in the DMMP.

With regard to providing a local sponsor, in your letter you indicated three representatives as the designated sponsor. Although the Corps would prefer one sponsor, we will be happy to work with all three. Please provide points of contact for future coordination efforts. This project needs to be a joint effort and we would expect the Non-Federal sponsor to participate.

The Corps has contacted Mr. Richard Powers of your office to set up an initial coordination meeting which will be in the near future. If you have any questions, please contact Mr. Terry A. Long or Mr. Joseph Wanielista at (313) 226-6758 or (313) 226-6773, respectively.

Sincerely,

W. Scott Parker, P.E.
Deputy District Engineer,
Project Management

CC:
CELRE-ET-OT-T
CELRE-PM-PL

LONG
WANIELISTA
ZANDT

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
DETROIT AREA OFFICE
P.O. BOX 09258
DETROIT, MICHIGAN 48209-0258

IN REPLY REFER TO:
Planning Division
Environmental Analysis Branch

Finding of No Significant Impact and Statement of Findings

Upper Saginaw River
Dredged Material Disposal Facility
Saginaw And Bay Counties, Michigan

Prepared by: U.S. Army Corps of Engineers, Detroit District

Proposed Action: The Corps of Engineers is proposing to construct and operate a Dredged Material Disposal Facility (DMDF) for disposal of sediments from maintenance dredging of the upper Saginaw River Federal navigation project. The site would be constructed on 281 acres of farmland located within portions of Saginaw and Bay Counties, Michigan. The facility is designed to hold 3.1 million cubic yards of material to be dredged over a minimum 20-year period. The facility site is underlain by clay and would have clay perimeter dikes constructed to a height of approximately 11 feet. The proposed DMDF includes a weir to release effluent to the Saginaw River. Sediments to be placed in the DMDF are contaminated with elevated levels of dioxin. Maintenance of the Federal channel in the upper Saginaw River would allow continued economic benefits associated with navigation. The local sponsor for this project is Saginaw County.

Coordination: A public notice dated May 20, 2004, announced and made available to all interested agencies, public groups and citizens the ***Phase II Report, draft dredged Material Management Plan and Environmental Assessment for the Upper Saginaw River, Michigan.*** Coordination with interested parties including the State of Michigan and its Department of Environmental Quality (MDEQ), Department of Natural Resources and Historic Preservation Office, as well as, U. S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and Saginaw County have been ongoing throughout development of this project.

Comments in response to the Environmental Assessment were received from various individuals and organizations. Overall, agencies and local governments are in support of the project. The U.S. Fish and Wildlife Service requires a "no work" window between January 15 and May 10 of every year the project is authorized, so as not to adversely affect the bald eagle.

Concerns of nearby residents have to do with health and safety issues, wildlife protection, preference for an alternate location, as well as a desire to see an Environmental Impact Statement prepared. Impacts to nearby residents have been considered. The design of the facility, and operation features, would provide containment for the nature and contaminant level in the dredged material to be placed. Once in the facility the material will vegetate quickly and will not

impact human exposure. The entire facility from the outside perimeter of the clay dikes will be fenced. Intermittent disturbances to residents from operations at the facility have been acknowledged.

Effects and Impacts: Impacts associated with the proposed project include the irretrievable loss of farmland. The project would result in a change to farm habitat and aesthetics. Construction of the facility would involve creating perimeter dikes from on site materials, which would result in temporary truck traffic, noise, vibrations, and air emissions. Wildlife may be temporarily displaced at the site. Environmental consequences of periodic disposal activity would be local in scope and of minor magnitude. No significant impacts to threatened or endangered species, wetlands, archeological or historical sites/items would be expected to occur due to the proposed action. Project benefits include continued maintenance of the commercial navigation project in the Upper Saginaw River and the continued economic benefits associated with it. The project is located within the 100-year floodplain; however, the project would not encourage floodplain development, nor would it impact flood stages. The proposed action complies with the Federal Executive Order 11988, Flood Plain Management, because there is no practicable alternative to construction in the flood plain.

Discharges to the Saginaw River would be monitored to meet specified standards and would be in compliance with Section 404 of the Clean Water Act. The MDEQ has issued a Section 401 of the Clean Water Act, water quality certification, dated March 16, 2005.

Determinations:

The Section 401 water quality certification for the project includes controls to ensure the effluent to be discharged from the facility meets state water quality standards. The certification does not allow a discharge from the DMDF to groundwater.

The Section 401 water quality certification requires preparation of a DMDF Management Plan, which preserves the long term integrity of the facility, includes closure requirements and minimizes exposure of wildlife. A Management Plan for the facility will be prepared in coordination with MDEQ to ensure safe operation and management of the facility.

Periodically, shoaled areas in the navigation channel would be sampled to determine the character of the material under existing condition. For each dredging event, a dredging plan would be developed. Based on current soundings and recent 2004 sediment data, the next dredging event would remove shoals from river mile 4.7 to 16.5. The dioxin levels in the material to be dredged (river mile 4.7 to 16.5) average 321 ppt, because of one small shoal with an elevated level. This shoal would be dredged first and subsequently covered by the remaining dredged material, which has an average of 166 ppt. of dioxin. In the future, if testing in the Federal channel indicates much higher dioxin levels, disposal, burial and handling would be considered and further environmental documentation may be required.

A number of alternatives for disposal of dredged material from the Upper Saginaw River have been investigated over a 26-year period. Recent alternatives evaluated include an adjacent farmland site, a type III landfill option and the no action alternative.

Findings and Conclusion: The project, if constructed and operated properly, will not present unacceptable risks to public health, safety and the environment. The Environmental Assessment and 404(b)(1) evaluation indicate that the proposed project does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an Environmental Impact Statement will not be prepared. It is my determination to proceed with the proposed Upper Saginaw River Dredged Material Disposal Facility.

25-Mar-05
Date

Donald P. Lauzon
Lieutenant Colonel, U.S. Army
District Engineer

Addendum
Phase II Report
Dredged Material Management Plan Study
September 2005

Upper Saginaw River, Michigan

The following is an addendum to the main report, *Phase II Report, Final Dredged Material Management Plan Study* dated July 2004. This addendum documents the reasons for a construction cost increase and examines whether the recommended plan is still the best alternative.

The *Phase II Report, Final Dredged Material Management Plan Study* dated July 2004, approved by LRD on 8 April 2005, included as the recommended plan implementation of:

Alternative 1 - Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility (DMDF). This alternative consists of constructing a DMDF on 281 acres, which will provide the required 3,100,000 CY capacity. As such, the site will meet the 20 - year capacity requirement, as mandated in ER 1105-2-100.

During the 401 certification process it was agreed between the Corps of Engineers and the Michigan Department of Environmental Quality (DEQ) that the Corps would provide additional borings at the proposed site in order to insure the DMDF would not allow for seepage of contaminants. After collection of additional soil borings, it was determined that a trench and cutoff wall should be constructed below the alignment of the proposed dikes to prevent under seepage. This cutoff wall will also serve as an inspection trench during construction to locate any drainage tiles or other crossings, as well as a cutoff for seepage under the constructed dikes. The costs for constructing a cutoff wall were not included in the concept design used in the DMMP.

The criteria used for establishing the "Federal standard" (Recommended Plan) and to evaluate the alternatives is in the Federal Register, 33CFR dated April 26, 1988, which states that the recommended dredged material disposal alternative must be engineeringly feasible, environmentally acceptable, and the least costly. A re-evaluation of the alternatives was completed based on the need for each CDF alternative to include an under-seepage protection measure. The environmental impact analysis of the revised Alternative 1 is essentially the same

as for the originally proposed project, the only change has been additional engineering and construction requirements to assure that contaminated materials remain within the CDF. The footprint of the project has not changed, a cutoff wall has been added.

Alternative 2 - Develop the Buena Vista Township Site, East of Saginaw River, into a Dredged Material Disposal Facility. - This alternative consists of a 274-acre farm site of which the MDEQ also considers as farmed wetland, and the MDEQ would require wetland mitigation at this site. As such, only 131 acres of land could be used for a DMDF; the reduced acreage will not meet requirements for the 20 - year capacity of 3,100,000 CY without constructing much larger perimeter dikes to create a taller facility. Also, an active railroad line on the site requires a minimum of a 50 ft offset for construction of dikes, which reduces the capacity. Considering that the Zilwaukee Twp. site and the Buena Vista site are geologically similar (Reference DMMP Technical Appendix A, page A-7) and that both sites have drain tiles for farming, it is concluded that a trench cutoff wall is also needed for Alternative 2, and the trench cutoff wall will be required under EM1110-2-1913. Trench cutoff walls were not included in the July 2004 report for this alternative, but would increase the construction cost an additional $676,000. See revised Table 3 below. Alternative 2 will not be considered further.

Alternative 3 – Place Dredged Material at the General Motors Powertrain (Saginaw) Metal Casting Operation Landfill. - This Type III landfill has adequate remaining capacity to satisfy the 20-year placement mandate, and is close to the dredging area. However, General Motors requested a release from liability for all dredged material placed in the landfill and all future materials placed their by General Motors. Without the support of the MDEQ on this issue, General Motors later withdrew its site from possible participation in this project. Also, operating expenses would be higher than using a typical CDF, since Type III landfills require that all placed material be considerably dryer than the dredging process normally produces. The triple handling of the dredge material through decanting, then trucking to the landfill, then placing the material (not including the tipping fee) makes this alternative costly. Also, the drain tiles for the landfill connect into a waste water treatment plant. They require a carbon filter to treat the effluent. The addition of a carbon filter has been estimated at $1 million. Therefore Alternative 3 is still not the least costly alternative and will not be considered further.

Alternative 4 - Beach Nourishment - This alternative considers the feasibility of using the material to enhance area beaches or return the material into the natural system from which it came. The contaminated nature of the sediment makes it unsuitable for beneficial reuse. As such, Alternative 4 is not engineeringly feasible or environmentally acceptable and will not be considered as a candidate for implementation.

Alternative 5 - Recycle the Dredged Material - which consists of a hydrocyclone process of the dredged material. The July 2004 report comparison for Alternative 1 was $1,500,000 construction cost for 3,100,000 cubic yard capacity, which equates to $0.48 per cy. The new calculation for Alternative 1 increases the unit price from $0.48 per cy to $0.76 per cy, versus $32.17 per cy for recycling. Therefore Alternative 5 is still not the least costly alternative and will not be consider further.

TABLE 3 - Summary of Alternatives				
Alternative	Placement	Capacity cubic yards	Construction Costs ($)	Recommend to Phase II
Zilwaukee Twp. Site	Upland	3,100,000	2,350,000	Y
Buena Vista Twp. Site	Upland	3,100,000	2,876,000	N
General Motors	Upland	5,000,000	-----[2]	N
Beach Nourishment	Upland	Unlimited	------	N
Recycle Dredged Material	Upland	Unknown [1]	------	N
No Action	N/A	N/A	-----	N
1. The dredged material that was determined to be recyclable, yields only 15.86% clean sand.				
2. Per discussion with General Motors, tipping fee range $8-$10 per yard equates to $24.8M- 31.0M.				

CONCLUSION: Alternative 1 - *Develop the Zilwaukee Township Site, West of Saginaw River, into a Dredged Material Disposal Facility* continues to meet the criteria for the recommended plan. It is engineeringly feasible, environmentally acceptable, and the least costly.