US Army Corps of Engineers®

CHICAGO DISTRICT

DESIGN DOCUMENTATION REPORT

INDIANA HARBOR AND CANAL MAINTENANCE DREDGING AND DISPOSAL ACTIVITIES

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INDIANA HARBOR AND CANAL MAINTENANCE DREDGING AND DISPOSAL ACTIVITIES – DESIGN DOCUMENTATION REPORT (DDR)

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Table 1. List of Acronyms

ASA(CW)	Assistant Secretary of the Army for Civil Works
CDF	Confined Disposal Facility
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
CMP	Comprehensive Management Plan
CWA	Clean Water Act
CY	Cubic Yard(s)
DDR	Design Documentation Report
ECI	Energy Cooperative Industries
ECWMD	East Chicago Waterway Management District
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
HASP	Health and Safety Plan
HTRW	Hazardous Toxic Radioactive Waste
HQUSACE	Headquarters, U.S. Army Corps of Engineers
IDEM	Indiana Department of Environmental Management
IHC	Indiana Harbor and Canal
IHC/GCR	Indiana Harbor Canal/Grand Calumet River
LRD	Lakes and Rivers Division
MCACES	Micro Computer Aided Cost Estimating System
MFR	Memorandum for Record
MOU	Memorandum of Understanding
MSL	Mean Sea Level
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OSHA	Occupation Safety and Health Act
PAHs	Polynuclear Aromatic Hydrocarbons
PCA	Project Cooperation Agreement
PCBs	Polychlorinated Biphenyls
POCs	Pollutants of Concern
POTW	Publicly-owned Treatment Plant
RCRA	Resource Conservation and Recovery Act
ROW	Right-of-Way
SBR	Sequential Batch Reactor
TCLP	Toxic Characteristic Leaching Procedure
TRPH	Total Recoverable Petroleum Hydrocarbons
TSCA	Toxic Substance Control Act
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WES	Waterways Experiment Station

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DESIGN DOCUMENTATION REPORT (DDR)

GENERAL

Prior Studies and Reports

1. The following prior navigation reports for disposal of contaminated sediment within Indiana Harbor and Canal include:

2. In 1975, the Chicago District began to formulate an economically feasible and environmentally acceptable plan for disposal of dredged materials from the Indiana Harbor and Canal (IHC). This effort included four distinct phases of plan formulation. On December 7, 1992, the District presented a briefing to representatives of the Headquarters, U.S. Army Corps of Engineers (HQUSACE), on the results of the plan formulation completed up to that time. The HQUSACE subsequently recommended that the Chicago District submit a draft Comprehensive Management Plan (CMP) Report on the IHC dredged material disposal issue, as a decision document. That guidance was contained in a CECW-LM 2d Endorsement, dated January 25, 1993, on a CENCC-PP basic Memorandum, dated October 30, 1992, subject: Indiana Harbor and Canal Confined Disposal Facility (CDF) Policy Issues.

3. On May 17, 1993, the District Engineer briefed the Acting Assistant Secretary of the Army for Civil Works [ASA(CW)]. In a Memorandum to the Director of Civil Works, dated May 21, 1993, the Acting ASA(CW) provided further guidance regarding preparation of the CMP Report, primarily concerning Resource Conservation and Recovery Act (RCRA) liability and cost sharing issues.

4. A draft CMP Report, dated June 1993, was prepared in response to the Acting ASA (CW) and HQUSACE guidance. A Feasibility Review Conference on this report was held in September 1993 at HQUSACE. Representatives of the ASA(CW), the Washington Level Review Center, the HQUSACE, the North Central Division, and the Chicago District attended the conference. The results of this conference were summarized in a CENCC-DDE(PM) Memorandum for Record (MFR), dated October 12, 1993, subject: Feasibility Review Conference - Comprehensive Management Plan, IHC Maintenance Dredging and Disposal Activities, which was furnished to the Acting ASA(CW) and HQUSACE. Subsequent guidance to the District Engineer on revisions to be made in the CMP Report before its distribution for public and agency review was furnished in a CECW-LM memorandum, December 20, 1993, subject: Project Guidance Memorandum for the Comprehensive Management Plan, IHC Maintenance Dredging and Disposal Activities.

5. The Final CMP Report dated January 1999 incorporated the guidance provided in the CECW-LM December 20, 1993 memorandum. The report consists of a main Feasibility Report, a Final Environmental Impact Statement (FEIS) and supporting appendices.

PURPOSE AND SCOPE

6. The bottom sediments in the IHC are contaminated and not suitable for open water disposal in Lake Michigan, nor are they suitable for unconfined upland disposal or beneficial use. The purpose of this project is to dredge and dispose of heavily contaminated sediment from within and adjacent to the Federal navigation project. The purpose of the DDR is to prepare a design that will create a Confined Disposal Facility (CDF) to contain the dredged sediment and function in the capacity to meet RCRA features of closure and corrective action for the existing Energy Cooperative Industries (ECI) site.

7. The scope of the Design Documentation Report (DDR) is to prepare a design of the selected plan in the CMP. The selected plan in the CMP is the Cooperative Dredging Plan. The level of detail for the DDR design will support the M-CACES cost estimate presented, and the Project Cooperation Agreement (PCA). In general, the level of design detail for certain features of the project are sufficient to proceed to Plans and Specifications. For some of the features in-progress documentation design will be required . The supporting technical analysis for hydrology and hydraulics, environmental engineering, geotechnical, structural, mechanical, and civil design along with a detailed cost estimate are presented in ten appendices: A. DIKES AND CDF LAYOUT; B. GROUNDWATER PROTECTION; C. SUMMARY OF GEOTECHNICAL INVESTIGATIONS; D. EFFLUENT TREATMENT SYSTEM; E. DREDGING AND PLACEMENT PLAN; F. RAILROAD RELOCATION; G. MONITORING PROGRAM INCLUDING RCRA/TSCA; H. COST ENGINEERING; I. HTRW; and J. REAL ESTATE.

8. The CMP/EIS was reviewed throughout the Corps hierarchy, including LRD, HQUSACE, and ASA(CW). Since the final CMP was completed in January 1999 there have not been any changes in design features. This DDR is a technical document and does not contain formulation issues. The in-progress design documentation will continue for some of the required project features. Additional design documentation will be prepared for the Dikes and CDF Layout, Groundwater Protection Plan, Effluent Treatment System, Dredging and Placement Plan, and Monitoring Program including RCRA/TSCA elements.

9. The DDR design is prepared in conformance with the approved CMP Cooperative Dredging Plan. The plan is supported by the local sponsor, East Chicago Waterway Management District, and will be constructed on property owned by the local sponsor.

PROJECT DESCRIPTION

Authorizations

10. Indiana Harbor and Canal (IHC) is an authorized Federal navigation project located in East Chicago, Indiana. The original authorizing document was H. Doc. 1113, 60th Cong., 2d Sess., taken from the River and Harbor Acts of 1910. Project features include breakwaters at the harbor entrance and a deep-draft navigation channel.

Location

11. Indiana Harbor is located in East Chicago, Lake County, Indiana, as shown on Plate 1. It is on the southwest shore of Lake Michigan, 4-1/2 miles east of the Indiana-Illinois State line and 17 miles from downtown Chicago. Indiana Harbor has an entrance channel and outer harbor protected by breakwaters, and an inner harbor. The inner harbor consists of the Indiana Harbor Canal and its two branches. The main channel extends from the lakeward E. J. & E. Railway Bridge to the Forks, a distance of 7,400 feet. Near The Forks, there is a small turning basin located on the southeast side of the canal about 600 feet lakeward of Canal Street. From The Forks, the Lake George Branch extends west for a distance of 6,800 feet and the Calumet River Branch extends south for about 2 miles where it joins the Grand Calumet River (GCR).

12. The Confined Disposal Facility (CDF) will be constructed on local sponsor property. The CDF site consists of about 164 acres of land formerly occupied by an oil refinery owned by Atlantic Richfield Company and subsequently acquired by Energy Cooperative Industries (ECI) as shown on Plate 2. The site is adjacent to the Lake George Branch of the IHC to the south and Indianapolis Boulevard to the east. ECI filed for bankruptcy in 1981 and abandoned the site. In 1989, the city of East Chicago became the owner of the ECI site as payment for back taxes owed by ECI. In 1994, the property was transferred to the current local sponsor, the East Chicago Waterway Management District (ECWMD).

Description of the Cooperative Dredging Plan

Overview

13. The plan includes construction of a CDF on a portion of the ECI property, the site of a former petroleum refinery that currently has open RCRA status. Use of this site for the CDF is contingent upon the construction of specific RCRA closure and corrective action features. These RCRA features will be integral aspects of the CDF construction. The CDF will act as the final RCRA cap for that portion of the ECI site upon which the CDF is constructed.

14. The plan further provides for maintenance dredging of contaminated channel sediments by closed-bucket or environmental bucket mechanical dredging equipment with disposal of the dredged material in the CDF. Dredging will be undertaken

throughout the IHC Federal navigation project to authorized project depths and widths. Dredging will also be completed in the appropriate berthing areas outside of the authorized channel limits at non-Federal expense to provide depths commensurate with those in the Federal channel. Space in the proposed CDF could also be allocated to accommodate dredged materials from the Inland Steel Company Consent Decree sediment remediation activities and other similar activities that might be required by the U.S. EPA or IDEM along the IHC. Use of the proposed CDF will be limited to disposal of dredged materials from the Indiana Harbor Canal/Grand Calumet River (IHC/GCR.) The CDF is not intended to be used for disposal of dredged materials from other harbors or waterways in Indiana or other Great Lakes states.

15. In 1998 the USEPA published final rulemaking on the Toxic Substances Control Act (TSCA) and Resource Conservation & Recovery Act (RCRA). These two rulemakings each include language addressing dredged material. The potential ramifications with respect to this project are unclear at this time. The rulemakings could impact the project with respect to characterization requirements associated with the presumptively hazardous sediments located in the south corner of the Anchorage and Maneuvering Basin, and sediment located outside the Federal channel (discussed on page E-13 of the CMP). Characterization of project sediment will be conducted prior to dredging. Since the dredging project will not begin prior to year 2005, additional sampling at this time will be of limited value. The results of sampling will be more representative if the sampling occurs at a time closer to the actual dredging. The intent of this sampling will be to evaluate worker health and safety concerns, to confirm TSCA sediment volumes and locations, and to determine hazardous characteristics, if at that time it is determined to be appropriate and required. Note that requirements at the time of actual dredging may be different, due to the incorporation of the new rulemaking, which could change the conclusions reached in the Comprehensive Management Plan (CMP), specifically addressed on pages 15-16, 89 and 114 concerning this issue. Furthermore, the sediment characterization plan(s) will be reviewed and approved by both IDEM and USEPA.

RCRA-Related CDF Aspects

16. The ECI property parcels are shown on Plate 3, and the CDF plan is shown on Plate 4. Parcel I of the ECI site previously housed the RCRA hazardous waste units. These structures were razed along with the rest of the above ground structures, but were never closed in conformance with the RCRA regulations. Due to the ubiquitous nature of the on-site contamination on this Parcel, the Indiana Department of Environmental Management (IDEM) determined that closure in-place will be most appropriate for the area which previously housed the hazardous waste units. The in-situ closure design for Parcel I will include a cutoff wall, a gradient control system consisting of groundwater extraction wells, which will maintain groundwater flow into this portion of the CDF, and an overlying 3-foot compacted clay cap with a hydraulic conductivity of 10^{-7} cm/s. The compacted clay cap will be placed on the existing surface and will overlie Parcel I. The cutoff wall will extend approximately 33 feet from the ground surface into underlying clay till unit. The United States Environmental Protection Agency (US EPA) has determined that construction of these components will also address the corrective action requirements for Parcel I. These RCRA closure and corrective action components have

been incorporated into the proposed CDF design. Once constructed, Parcel I will be subject to the RCRA post-closure care and permitting requirements applicable to hazardous waste units for maintenance and monitoring. The post-closure care requirements under RCRA will be integrated into the maintenance and monitoring requirements for the CDF.

17. The CDF will also overlie ECI site Parcels IIA and IIB. Unlike Parcel I, these parcels never housed hazardous waste units and are not subject to the RCRA closure requirements. However, these Parcels are subject to the RCRA corrective action requirements, which address releases associated with waste handling practices to the environment. Given the apparent widespread contamination of these parcels, it was determined that an acceptable corrective action condition for these Parcels will be similar to the proposed corrective action outlined above for Parcel I. This will consist of a perimeter cutoff wall with a hydraulic conductivity of 10^{-7} cm/s tied into the underlying clay unit, and a groundwater removal system consisting of groundwater extraction wells placed within the interior of the cutoff wall. The final cap for this site will be accomplished at the same time as final closure of the CDF. The corrective action components for Parcels IIA and IIB will be incorporated into the CDF design and connected to the closure/corrective action components for Parcel I. The corrective action maintenance and monitoring requirements for these Parcels will be integrated into the maintenance and monitoring requirements of the CDF.

18. The features to create an inward hydraulic gradient and provide for treatment of groundwater collected within the cutoff walls will include installation of wells with appropriate pumps to provide for gradient control. The wells will be located around the perimeters of Parcels I, IIA, and IIB. Contaminated groundwater collected in connection with the gradient control system will be discharged to the canal after treatment at an on-site treatment plant.

<u>Confined Disposal Facility</u>

19. The CDF will be constructed on Parcels IIA and IIB, as shown on Plate 4. A single-track railroad spur currently separates the two Parcels. The CDF will be constructed as three separate cells, two in the southern portion of the site and one in the northern portion. The west cell in the southern portion of the site will be used to create an isolated subcell for the disposal of TSCA level polychlorinated biphenyls (PCBs) contaminated sediments (greater than 50 ppm PCBs). The design elements for the TSCA cell will require either a "coordinated approval" or a "risked-based approval" from USEPA. The permitting procedure will be delineated during the preparation of the Regulatory Requirements Report. The elements of the CDF include a cutoff wall with a hydraulic conductivity of 10^{-7} cm/s around the perimeter of Parcels I, IIA and IIB that ties into the underlying clay unit; a ground-water gradient control system; on-site treatment of groundwater collected from Parcels I, IIA, and IIB and pore water and precipitation runoff from within the CDF; segregation of TSCA level PCB contaminated sediments; and capping of Parcels IIA and IIB with three feet of clay, six inches of sand, two feet of clean fill and six inches of seeded topsoil. TSCA maintenance and monitoring requirements will be integrated into the maintenance and monitoring requirements for the

CDF.

20. Plate 5 shows a cross-section through the CDF. The CDF dikes will be constructed in two stages in incremental lifts of 15 feet each. The first stage earthen dikes will be constructed using off-site clean fill materials. The second stage dikes will be constructed of off-site materials beginning approximately 9 years after initial dike construction. The dikes will be constructed on top of a 3-foot layer of compacted clay tied into the cutoff wall. The interior side slopes of the dikes will be lined with a 3-foot layer of compacted clay tied into the bottom clay layer. On-site materials will be used to construct the initial 10-foot lift of the center cross dike separating the two cells of Parcel IIA. Dried dredged material will be used to continue subsequent construction of the cross dike.

21. The final 6 feet cap of the second stage lift will consist of clay (3’), sand (6’’), clean fill (2’) and seeded topsoil (6’’). The clay will seal the CDF and provide for the RCRA capping of Parcels IIA and IIB. The sand will provide for drainage of precipitation off of the CDF. The exterior side slopes of the dikes will also be covered with topsoil, seeded, and landscaped as the dikes are constructed to control erosion and enhance their visual appearance.

22. Construction and operation of the CDF will require an on-site treatment plant to provide treatment of the pore water and precipitation runoff within the CDF and groundwater collected from the gradient control system.

23. The CDF will have a capacity of approximately 4.83 million cubic yards (CY). The initial 15-foot lift will have a capacity of approximately 2.3 million CY. Construction of the second lift of 15-feet will increase the CDF capacity to 4.83 million CY. The capacity estimate is based on a volume calculation taken from the geometry of the designed CDF. It is a purposefully conservative estimate because it does not take in to account any consolidation, which has been estimated at 19% during the active dredging phase.

Dredging Operations

24. Dredging will be performed using a closed bucket mechanical dredge. The dredged material will be loaded onto barges or scows that will be then moved to the disposal area. Next, dredged material will be loaded into trucks at the CDF rehandling area (Plate 6). The trucks will then transport the dredged material to the CDF by use of haul roads placed around the site and on top of the dikes.

25. Dredged material will be placed in the CDF in lifts of approximately 3 feet. Such limited lifts will promote greater efficiency of natural drying processes and greatly enhance potential gains in CDF capacity. To allow for natural drying, not more than one 3-foot lift will be placed on top of the previous lift in each cell during any given disposal event. Typically, a lift will be allowed to dry for 2-5 years, but no less then one year, before a subsequent lift will be placed above it. Lifts will continue to be placed until 3 to 4 feet of freeboard remained, at which time the containment dikes will be raised.

26. Each cell will be graded towards a decant structure to avoid ponding of water. Placement will begin at the high end of each cell and continue towards the sump. During the first placement of dredged material, dump trucks will drive into the CDF and place the dredged material within a cell. Subsequent lifts will be dumped from the edge and mechanically distributed.

27. During the first year of CDF construction, the southwest cell dikes will be completed. In the second year, dredged material will be placed in the southwest cell while the dikes are being constructed in the southeast and north cells. Dredged material will be placed in the southeast and north cells during the third year, while the existing dredged material in the southwest cell was managed to promote drying and consolidation. Placement of dredged material will then be alternated between the southwest cell one-year and the southeast and north cells the following year over the next 8 years. No dredging will be undertaken in the following year. Dredging and disposal will be subsequently completed on a 4-year cycle until the three cells were filled to capacity, which will occur about year 2033, and then capped with clay. This cycle will consist of rotating the disposal on an annual basis between the three cells followed by 1 year of no dredging in the fourth year. TSCA material, PCB-contaminated dredged materials from Reaches 6 and 13, will be placed in the southwest cell beginning in the 8^{th} year. For further information see Appendix E, Table E-1.

Project Features

<u>Dikes, CAP and CDF Layout</u>

28. The CDF will be constructed with an interior and exterior dike system. The function of the exterior dike system is to enclose the entire CDF and prevent migration of contamination from moving offsite. This dike system will incorporate a barrier layer consisting of three feet of compacted clay with a hydraulic conductivity of 10^{-7} cm/s and will be tied into a subsurface cutoff wall. Interior dikes will be of two types: dikes that partition the CDF into three main cells, and dikes that create sub-cells within the main cells. The first stage of the interior dike walls will partition the CDF into three cells: North cell, Southwest cell, and Southeast cell. These dikes will be of similar construction as the exterior dikes but will not be tied into the subsurface cutoff wall. Subsequent stages to these dikes will be constructed from dried dredged material. As noted above each of main cells will be further sub-divided into smaller cells created by in-place dried material. The purpose of the sub-cells is to create a manageable and workable area. This area must be small enough to allow for the use of intrusive dewatering techniques, such as digging a drainage trench network system.

29. The CDF will serve in the capacity as the final cap for the RCRA features of the ECI site. This includes Parcels I, IIA, and IIB. The CDF proper does not cover Parcel I, however, this area will serve as a sediment rehandling location and house the effluent treatment system. The existing surface area of Parcel I will be overlaid with a cap of comparable attributes to that of the final CDF cap. The details will be provided during preparation of plans and specifications for the layout of the dikes.

30. The CDF proper will overlie ECI site Parcels IIA and IIB. The final cap to the CDF will also serve as final closure to these Parcels in accordance with RCRA. The cap will consist of three feet of compacted clay which has a hydraulic conductivity of 10^{-7} cm/s, six inches of sand to act as a drainage layer, two feet of clean fill and six inches of seeded topsoil. The CDF cap will tie into the subsurface cutoff wall, which surrounds the site and the cap covering Parcel I.

Groundwater Protection System

31. The Groundwater Protection System is composed of two elements. The first is a cutoff wall with a hydraulic conductivity of 10^{-7} cm/s that extends around the entire perimeter of Parcels I, IIA, and IIB. The cutoff wall will be tied into the underlying geological clay unit about 30-35 feet below the site surface. The second aspect is a groundwater removal system consisting of extraction wells placed within the interior of the cutoff wall. The groundwater extraction system will be used to create an inward gradient of a 2-foot drawdown along the inside perimeter of the CDF. The pumpage from this system will be routed to the effluent treatment system before being discharged back to the Lake George Branch of the IHC.

Effluent Treatment System

32. The effluent treatment system will be used to treat water coming from three sources: pore water released during disposal, surface runoff within the CDF, and pumpage from the groundwater protection system. The pollutants of concern (POCs) include polychlorinated biphenyl's (PCBs), polynuclear aromatic hydrocarbons (PAHs), ammonia, metals, total suspended solids (TSS), and Oil & Grease.

33. A number of unit operations were evaluated to determine their effectiveness at treating the POCs associated with this project. The processes evaluated included: flow equalization, oil/water separation, sand filtration, cyanide removal, chemical precipitation, neutralization, biological treatment, activated carbon adsorption and ammonia stripping. Through the process of a treatability study it was determined that an effective system will incorporate: flow equalization with oil skimmer, chemical precipitation, neutralization, biological treatment, sand filtration, and activated carbon adsorption. Given the nature of the wastestream(s) originating for the project the unit operations/processes of cyanide removal, ammonia stripping, and a dedicated oil/water separation were not required to meet the conservatively based discharge criteria that were used in the evaluation. Refer to Appendix D for details.

34. Once treated, the CDF effluent will be discharged to the Lake George Branch of the IHC.

Dredging and Placement Plan

35. A dredging simulation model was run to estimate a dredging frequency and schedule. This allows for the efficient removal of sediment where and when it is needed and optimizes the use of the navigation channel.

Railroad Relocation

36. The ECI site has an existing CSX Railroad spur, servicing the LTV Steel Company, which crosses the site from east to west and separates ECI site Parcel IIA from Parcel IIB. An evaluation was completed of feasibility of relocating this track to the north edge of Parcel IIB. The evaluation showed that there will be a substantial increase in CDF capacity and cost savings due to relocating the rail spur. Therefore, it was decided to relocate the Railroad spur to the north edge of Parcel IIB.

Monitoring Program including RCRA/TSCA

37. This project is complex in that it involves the overlap of multiple environmental regulations. Plans will be developed for monitoring during dredging; monitoring during the construction, operation, maintenance, closure, and post-closure care of the CDF on Parcels IIA and IIB; and monitoring during the construction of the cap, closure, and post-closure of Parcel I of the ECI facility at Indiana Harbor.

38. The plans described in Appendix G are intended to provide sufficient detail for the Project DDR. The specific details will be provided during preparation of the Regulatory Requirements Report. Given the unique nature of this project, which is regulated by multiple environmental regulations including RCRA, TSCA, and the Clean Water Act (CWA), a memorandum of understanding is currently being developed with USEPA and IDEM. This memorandum will outline the regulatory framework to which the project will adhere. As such, the specific aspects of RCRA closure/corrective action, post closure, and TSCA permit application will be incorporated as this memorandum is finalized.

Additional Features

39. There are additional features to maintain aesthetics and security at the site. The exterior sideslopes of the dikes will be covered with topsoil, seeded and landscaped to enhance their visual appearance. A fencing barrier will be installed to provide security around the perimeter of the site.

PROJECT COOPERATION

40. Prior to initiation of construction, the East Chicago Waterway Management District, a non-Federal public agency, legally empowered and financially capable under state law, would be required to enter into a Project Cooperation Agreement with the Secretary of the Army for Civil Works to provide the following items of local cooperation:

a. Provide all lands, easements, and rights-of-way, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features (including all lands, easements, and rights-of-way, and relocations necessary for dredged material disposal facilities).

b. Contribute in cash during construction, 25 percent of the cost of the confined disposal facility and pay an additional 10 percent of the cost of the disposal facility over a period not to exceed 30 years, but with the value of lands, easements, rights-of-way and relocations credited against this additional 10 percent payment.

c. Provide a pro-rated share of the operation and maintenance costs associated with the confined disposal facility over the life of the project on the basis of the estimated volume of dredged materials from non-Federal sources, presently estimated at 21 percent of the total estimated capacity of the CDF;

d. Provide, operate, maintain, repair, replace, and rehabilitate, at its own expense, the local service facilities, including adequate berthing areas at the deep-draft navigation docks with depths commensurate with the adjacent Federal project depth, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

e. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project, except for damages due to the fault or negligence of the United States or its contractors;

f. Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easement, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, or rehabilitation of the general navigation features. However, for lands the Government determines to be subject to the navigation servitude only the Government shall perform such investigation unless the Federal Government provides the non-Federal sponsor with prior Specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

g. Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features;

h. To the maximum extent practicable, perform its obligation in a manner that will not cause liability to arise under CERCLA;

i. Comply with all applicable Federal and state laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42

U.S.C. 2000d), a Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination the Basis of Handicap in Programs and Activities Assisted or conducted by the Department of the Army;"

j. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Acquisition Policies Act of 1970 Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and right-of-way and performing relocations for construction, operation, and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

k. Provide a cash contribution equal to the non-Federal cost share of the project's total historic preservation mitigation and data recovery costs attributable to commercial navigation that are in excess of 1 percent of the total amount authorized to be appropriate for commercial navigation.

l. Do not use Federal funds to meet the non-Federal sponsor's share of the project's total historic preservation mitigation and verifies in writing that the expenditure of such funds is authorized.

m. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total cost of construction of the general navigation features, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

n. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government; and,

o. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the general navigation features for the purpose of inspection, and, if necessary, for the purpose of operating, maintaining, repairing, replacing, and rehabilitating the general navigation features.

ENGINEERING INVESTIGATIONS, STUDIES AND DESIGNS

Geotechnical Investigations

<u>Subsurface Investigations</u>

41. <u>Ecology and Environment, Inc.</u> The United States Environmental Protection Agency (USEPA) contracted with Ecology and Environment, Inc. (EEI) to perform an expanded

site inspection of the ECI Site. This work was performed during September through December 1990 and documented in an "Expanded Site Inspection Report for the Energy Cooperative, Inc.", dated February 27, 1991. The work included collection of soil, surface water, groundwater, and sediment samples for analytical testing. In addition, 10 monitoring wells were installed on the site. These wells were designated as MW1 through MW10. Five of these wells were located on the site to be used for the confined disposal facility (MW1, MW4, MW5, MW6, and MW7).

42. Environmental Resources Management (ERM) - North Central, Inc. ARCO and the City of East Chicago, in agreement with the IDEM, began a subsurface investigation to determine the soil characteristics and the depth and extent of the contamination on the site and to initiate clean-up activities for the contamination of the ECI Site. The work at the ECI Site was performed in five phases, indicated below.

- Phase I: Surface Hydrocarbon Recovery - to address the confinement, handling, and recovery of hydrocarbons on the surface water.
- Phase II: Facilitation/Mobilization - start-up tasks related to initial site preparation, site topography, and sampling for industrial hygiene and waste management.
- Phase III: Free Phase Hydrocarbon Confinement/Recovery - confinement, handling, and recovery of free phase hydrocarbons on the groundwater beneath the site in the vicinity of the Lake George Branch of the Indiana Harbor.
- Phase IV: Reconnaissance Site Investigation - obtain existing information about the site and conduct non-intrusive sampling, and to select sampling locations for future phases.
- Phase V: Site Investigation - activities related to characterizing the near-surface, unconfined aquifer at the ECI Site.

43. ERM completed Phases I through IV from May 1991 until October 1992. Phases I through III are documented in a report entitled, Pilot Systems Report and Design Work Plan for the Full-Scale Free Phase Hydrocarbon Confinement/Recovery System, dated April 15, 1992 (four volumes). The subsurface investigation work was performed during Phase III and included drilling and installing twenty-eight shallow monitoring wells (MW11 through MW38), twenty-nine piezometers (P01 through P29), and four deep borings (BD01 through BD04). In addition, monthly progress reports were prepared from July 1991 through April 1992 documenting site activities including water level measurements and water quality sampling and testing.

44. Geraghty & Miller, Inc. ARCO contracted with Geraghty & Miller, Inc. to prepare a hydrogeologic design as part of the Phase III work and perform the Phase V portion of the work described above. The Phase III work is described in Hydrogeologic Design Hydrocarbon Confinement/Recovery System, dated June 10, 1992. This work consisted of determining the optimum location, pump settings and pumping rates for groundwater/hydrocarbon recovery wells and the affects on groundwater flow.

45. The Phase V work is documented in a report entitled, Phase V-A Investigation Report, ECI Refinery Site, East Chicago, Indiana, dated April 4, 1993. Relevant subsurface information from this report consisted of a detailed, long-term evaluation of the hydraulic interaction of the Canal and the shallow groundwater.

46. In addition, monthly progress reports were prepared from March 1993 through May 1994 documenting site activities including water measurements and water quality sampling and testing.

47. Patrick Engineering, Inc. Patrick Engineering (PEI) was contracted by the U.S. Army Corps of Engineers, Chicago District to obtain general information on the type, nature, and engineering characteristics of the subsurface soils and to perform a pump test to evaluate the hydraulic characteristics of the Calumet aquifer beneath the ECI Site. The exploration program consisted of drilling eight soil borings designated as CE-101 through CE-108. All borings, with the exception of CE-103, were drilled to the underlying glacial till formation, at a depth between 28 and 35 feet below ground surface. Boring CE-103 was drilled into bedrock, a depth of 112 feet below ground surface. Groundwater monitoring wells were constructed in borings CE-101, CE-103, CE-104, and CE-106 for the purposes of hydraulic conductivity testing and groundwater sampling. Four previously constructed (by others) monitoring wells were also sampled. The exploration investigation is documented in Final Report, Phase I Site Investigation, Indiana Harbor CDF Geotechnical Investigation, dated June 1996.

48. The pump testing consisted of step-drawdown and equilibrium pump tests. The tests were conducted in September and October 1996 from well CE-109. The pump testing procedures and analysis are included in a report entitled, Final Report, Indiana Harbor CDF Pump Test, dated January 1997.

Fly Ash Testing

49. The original Confined Disposal Facility (CDF) embankment design had assumed the use of a glacial till borrow material (silty clay) which would serve both as a structural fill and liner in the embankment. The borrow source became unavailable during the site permitting process, so consideration was given to the use of alternate structural fills for the embankment in the event that a silty clay material source is not available. One alternative considered was fly ash from the NIPSCO Schahfer Power Station in Kouts, Indiana.

50. The fly ash material is produced as a result of combustion of coal at the power station. Three test samples of the ash were collected directly from the storage silos over a several day period to be assured that the materials were representative of the process. A laboratory test program was undertaken to determine the geotechnical properties of the fly ash for use as a structural fill in the embankment. Of particular interest are compaction, strength and permeability characteristics of the material. The testing consisted of the following:

- Particle Size Analysis
- Specific Gravity
- Moisture-Density Relationships
- Hydraulic Conductivity
- Shear Strength (CIU)
- Consolidation
- Pin Hole Dispersion

51. Great Lakes Soil and Environmental Consultants Inc., under a contract with NIPSCO, conducted the sampling and testing. The test results are contained in a letter report dated July 16, 1998.

Dredged Material Dewatering Testing

52. Testing of sediments from the Indiana Harbor and Canal was undertaken to determine the feasibility of using the dewatered dredged materials as a foundation for the phased construction of the perimeter CDF embankment as well as qualitatively estimating the time and effort involved in dewatering the sediment.

53. Three schemes were presented in the Comprehensive Management Plan for the phased development of the perimeter embankment. These were:

- Upstream Development
- Centerline Development
- Downstream Development

54. Upstream Development/Centerline Development - Both of these schemes involve construction of the interior slope of the perimeter embankment on dewatered dredged material. Because the interior slope also incorporated a three-foot thick soil liner, any weak foundation condition that would result in a bearing capacity failure or differential settlement is of concern with regards to the liner integrity as well as the integrity of the RCRA closure cap over the CDF. The purpose of the testing program was to determine if the dredged material could be conditioned sufficiently to function as a suitable foundation for the perimeter embankment and final cap (adequate bearing capacity and settlement behavior).

55. Laboratory Testing Program - Sediment samples were obtained from the actual dredging reaches of the harbor. The samples were sent to the Waterways Experiment Station in Vicksburg, Mississippi to perform a series of laboratory tests. The geotechnical testing was performed in conjunction with environmental testing of the same material. Consolidation and strength characteristics were determined as a function of moisture content, which were the main focuses of the testing program. The laboratory testing consisted of the following:

- Grain Size
- Atterberg Limits
- Specific Gravity
- Consolidation - (self weight, fixed ring)
- Moisture-Density Relations
- Tri-axial Compression (CIU)

56. The grain size and atterberg tests performed by WES indicate that the material is an elastic silt (MH) with some fine sand (>20%). A summary of all of the tests results are contained in a letter report dated December 16, 1997. The information will be used to prepare a dredged material management plan explaining methods to achieve the required level of conditioning of the dredged materials.

Geophysical Survey

57. The U.S. Army Corps of Engineers, Waterways Experiment Station (WES) was contracted by the Chicago District to perform a surface geophysical survey. The purpose of this survey was to attempt to locate pipeline, concrete foundations, and other buried structures that may remain in-place following demolition of the site. The work was conducted in August 1995 and documented in a report entitled, Geophysical Investigations at the Indiana Harbor CDF Site, East Chicago, Indiana, dated January 1996.

Civil Design Investigations and Studies

Utility Surveys

58. In November 1994, Smith Engineering Consultants, Inc. was contracted by the U.S. Army Corps of Engineers (Chicago District) to review existing reports, as-builts drawings (record drawings), engineering drawings, utility maps, surveys and various other maps and reports that were provided by the Chicago District. Chicago District obtained the information from the ECI drawings and records archive provided by the bankruptcy trustee of Hopkins and Sutter. Smith Engineering then incorporated all the information into a series of digital utility maps (see Appendix A, Dikes, Cap and CDF Layout, Plates A-9 to A-32).

59. The maps include sanitary and storm sewer, water, oil, fuel, miscellaneous utilities and electric, steam, gas main and telephone utility lines.

60. After all the pipes were digitized into the computer, each utility and pipeline type was tagged with a separate symbol, which included attributes. The attributes contained the following information: description of the utility, size, elevation, status, supplier, any descriptive name and identification of the particular final drawing sheet the utility and pipeline can be located. Once the tagging was completed, a spreadsheet was compiled with the attributes of each tag and the local coordinates for each tag. This information is documented in a report entitled, Indiana Harbor CDF Utility – Tag Data, dated May 1999.

61. The data entry portion of their project begins at the southeast corner of the old Main Refinery and works north and the old North Tank Farm and works south through the old Main Refinery. A majority of the drawings reference the E.C.I. local coordinate system. This local coordinate system was utilized during the data entry phase and converted to the Indiana West State Plane coordinate system after the data entry was finalized.

62. Field reconnaissance was conducted, and many of the existing structures that contained Indiana West State Plane coordinates and local ECI coordinates or stationing were surveyed. Surveying was also conducted to provide conversion factors for translation between the two coordinate systems. Both coordinate systems are denoted on the plans so either system can be utilized. Two brass ACOE datum control points, were provided by the Chicago District and installed near the north portion of the project. The two new control points were installed on the bridges (HW 912) that are located at the northwest and northeast corners of the project. Two existing control points were field located on the south end of the project near the Indiana Harbor Canal.

63. The District has contacted all the utility companies that could be identified, and requested further information regarding any potential underground pipes in the area. The information collection is ongoing and is not complete at this date. The data obtained so far is purely a compilation of existing data and has not been field verified at this point.

Topographic Mapping

64. In April 1994, Aero-Metric Engineering, Inc. was contracted by the U.S. Army Corps of Engineers (Chicago District) to prepare aerial mapping, topographic and planimetric project mapping for the Indiana Harbor and CDF site in Lake County, Indiana. In April 1994, stereo aerial photography of approximately 164 acres of land was performed to complete the mapping requirements. Existing ground controls were used and verified to compile the mapping. The vertical datum is the Mean Sea Level (MSL) datum of 1929. The horizontal datum is in the Indiana State Plane Coordinate System. Maps were produced at a scale of 1 inch = 200 feet at one foot contour intervals at a level of detail consistent with final mapping requirements. Digital files in MicroStation Intergraph 3 dimensional format were produced for engineering design and construction. Topographic/planimetric maps are used as the base maps for project site and feature designs.

Hydrographic Surveys

65. In November 1994,Ocean Surveys, Inc. was contracted by the U.S. Army Corps of Engineers (Chicago District) to perform a condition hydrographic survey of Indiana Harbor and Canal with cross sections that start and end at the shorelines and/or structures so that the entire water is surveyed. The surveys were conducted throughout the Indiana Harbor and Canal Federal navigation channel and in the adjacent berthing and dockface areas outside of the Federal channel and met the accuracy requirements in "Hydrographic Surveying", EM 1110-2-1003, for Class1 hydrographic surveys. Existing Corps of Engineers monuments were used as much as possible and the AE was required to establish any additional survey controls necessary to accomplish the project. Soundings were taken in cross sections one hundred feet apart. The sounding lines approximately duplicated the location of the sounding lines from the previous 1990 survey. In addition cross check lines were surveyed as required for Class 1 surveys. An additional ten cross sections (one hundred feet apart) were taken parallel with and centered on the North Breakwater. The sections extended 100 feet east of the easterly end of the North Breakwater. Soundings were taken along each cross section starting and ending at a breakwater, channel wall or shoreline. The plotted soundings were at 10-foot intervals.

66. In April 1995, Ocean Surveys, Inc. was contracted by the U.S. Army Corps of Engineers (Chicago District) to plot the 1995 soundings for Indiana Harbor and Canal on the Chicago District's base maps. All CADD files and mylar plots provided conformed to EM 1110-1-1807, Standards Manual for USACE Computer-Aided Design and Drafting Systems Manual". Section plots for the 1994/1995 soundings are shown on plates E-13 to E-20 of Appendix E, Dredging and Placement Plan.

Environmental Engineering Investigations and Studies

Effluent Treatability Studies

67. The design of the waste water treatment system needed for treatment of effluent from the CDF required that treatability studies be conducted to screen, evaluate and test potentially viable treatment options. The Chicago District accomplished this task using a two-phased approach. The first phase was to evaluate treatment options, using existing information and completing an analysis based on a literature review and in-house experience with similar systems. The second phase involved collection, processing, and evaluation of potential treatment options, which were screened in the first phase. Treatment options were evaluated at the "bench-scale" in the laboratory.

68. Phase I. The first phase was completed by contracting with Maxim Technologies Inc., and the results of that effort are documented in a report titled Treatability Study Design for the Indiana Harbor Confined Disposal Facility (CDF) Effluent, Volumes 1 & 2, dated December 1998. The study objectives were as follows:

a. Evaluate IHC sediment pore water data, as well as the data associated with precipitation runoff from the sediment material to define the chemical characterization of the CDF effluent. The CDF effluent represents the influent to the treatment train, which will be developed through the treatability study process.

b. Define the chemical characterization of ECI site groundwater, which will be treated by the one optimized treatment train, which will also be developed through the treatability study process.

c. Define the effluent limitations (regulatory targets) the proposed CDF effluent/groundwater treatment train will have to achieve prior to discharging the final effluent to the Lake George Branch of the IHC.

d. Based upon a review of the water quality and quantity estimates prepared by the Chicago District, propose a laboratory methodology to simulate a design CDF effluent (treatability study influent) using sediment collected from the IHC.

e. Screen unit operations and unit processes appropriate for the treatment of the various analyte groups predicted to be present in the CDF effluent and the ECI site groundwater. Using preliminary screening techniques recommend a treatment train for both CDF effluent and the ECI groundwater for further treatability testing to verify anticipated achievable performance.

f. Develop a treatability study test plan addressing the evaluation of the individual treatment technologies comprising an optimized treatment train appropriate for the following aqueous waste streams at different times or as a combination wastestream:

1) Sediment pore water (interstitial water)

2) Precipitation runoff water

3) ECI site groundwater

4) Combination wastestream

69. Phase II. The study test plan developed in phase I was used to conduct the Phase II bench scale evaluation of the treatment unit operations and treatment train. Contracting with Maxim Technologies Inc. completed the second phase, and the results of that effort are documented in a report titled Treatability Study Report for the Indiana Harbor Confined Disposal Facility (CDF) Effluent, dated August 1999. The project objectives to the treatability study were as follows:

a) Collect and transport representative sediment and ECI groundwater samples to the analytical laboratory.

b) At the lab generate representative samples of sediment pore water, precipitation run-off, and a combination wastestream comprised of the pore water, precipitation water and groundwater at a pre-determined ratio.

c) Characterize samples of the wastestream(s), through laboratory analysis, which could be part of the CDF effluent.

d) Implement treatability testing.

e) Evaluate the results of the treatability testing for specific unit operations or processes to define pollutant removal efficiencies (performance).

f) Compare treated operational effluents to conservatively based discharge criteria to determine if proposed treatment train will be of acceptable quality for discharge to the Lake George Branch of the IHC.

g) Define potential limitations of unit operation and processes of the proposed full-scale treatment train.

h) Provide recommendations for further activities to proceed to the design of the proposed CDF effluent treatment system.

The level of design of the wastewater treatment plant, for this project DDR, is based on the results from the Phase II treatability testing and is provided in Appendix D. The final design of the wastewater treatment system will be completed during the preparation of the Treatment Plant DDR.

Sediment Quality and ECI Site Quality

70. The sediments from the Grand Calumet River and Indiana Harbor and Canal (GCR/IHC) have been sampled by a number of agencies and institutions for varying purposes during the last 20 years. The USEPA and USACE have sampled sediments from the Federal navigation channel in order to determine the appropriate disposal methods for dredged materials. The USACE, USEPA, Indiana Department of Environmental Management (IDEM) and a number of researchers from leading universities have also sampled the sediments from the GCR/IHC. A summary of the sampling events and results is provided below. For a more detailed discussion of sediment quality see the Final CMP, Appendix E, dated January 1999.

71. In 1977 the USEPA collected 13 grab samples from the Indiana Harbor and Canal. Samples were evaluated using physical, bulk chemical, and standard elutriate analyses. Sampling was conducted to determine the presence and distribution of contamination. The sediments collected from the canal and inner harbor were dark brown or black, oily silt, sediments in the approach channel were brown or gray sand and gravel. Most of the sediments in the harbor and canal were predominantly silt and clay. The sediments from the center of the canal, the eastward end of the approach channel and in the vicinity of the harbor were sandier in composition. Chemically, the sediments were found to contain high levels of metals (arsenic, cadmium, copper, iron, lead, magnesium, manganese, nickel and zinc), organics, nitrogen, phosphorous, volatile solids and PCBs. Comparison of these results with the USEPA 1977 interim guidelines resulted in the

classification of the Indiana Harbor and Canal as heavily polluted. In general sediments collected from the upstream portions of the canal were more highly contaminated than those from the outer harbor and the approach channel.

72. The USACE collected core samples at thirteen locations in the Indiana Harbor and Canal in 1979. The sampling locations were the same used by USEPA in 1977. The purpose of this sampling program was to determine the distribution, both laterally and vertically, of sediment contamination. Three-foot sections of each core comprised sub-samples used for physical, bulk chemical and standard elutriate analyses of the sediments. The results of the sediment analyses concurred with the USEPA's 1977 sampling and testing. However, two sites were found to contain PCB concentrations in excess of 50 ppm .

73. In 1980, the Waterways Experiment Station (WES) collected a large composite of sediment from three locations in the IHC for additional analyses. Tests included settling, filtration, leaching, coagulation, bioassay and bioaccumulation analyses. The results of the analyses were incorporated into a comprehensive report and are discussed later in the section on 1985 WES sampling.

74. In 1983, two sediment-sampling investigations were completed. A total of 27 core samples were taken for PCB and EP-Toxicity analyses by an engineering consultant contracted by the USACE. Sub-samples from each core were analyzed to develop the vertical distribution of PCB contamination, in terms of above and below project depth. The results of the PCB testing corroborated the 1979 PCB analysis. Elevated levels of PCBs were limited to two specific areas of the IHC and levels exceeding 50 ppm were only found in the deeper sub-samples. In general the PCB concentration increased with increasing depth. The EP-Toxicity testing was performed at the request of the Indiana State Board of Health. Five composite samples from sediment cores were collected and analyzed for EP-Toxicity. All constituents analyzed were below the "maximum concentration of contaminants for characteristic of EP-Toxicity." None of the samples were therefore classified as "hazardous" as defined by RCRA.

75. In 1984, the Detroit District of the USACE collected 18 core samples for an investigation on the feasibility of deepening selected Great Lakes harbors (USACE, 1984). Sampling was limited to the harbor and approach channel. Physical and bulk chemical analysis were performed, including a full priority pollutant analysis of a portion of the samples. This analysis showed the presence of a number of polynuclear aromatic hydrocarbon (PAH) compounds in the sediments.

76. In 1985, the USACE collected sediments from two locations (reaches with PCB levels greater than 50 ppm) in the IHC and one in Lake Michigan. The sediment was composited for a major research investigation performed by WES. As part of this effort a number of laboratory testing procedures were first developed. Testing included bulk chemical and physical analysis, settling, modified elutriate, leachate, surface runoff, capping, solidification, bioassay, and bioaccumulation tests. The bulk chemical analysis confirmed the presence of high levels of PAH compounds in sediments from the IHC.

Filtration tests showed that filter media of sand or carbon removed in excess of 97 percent of the suspended solids. The results of the coagulation tests indicated that polymer treatment was very effective in removing various contaminants. Results from surface runoff testing indicated that the contaminants in surface runoff from wet anaerobic sediment were in poorly soluble forms and generally dependent on the runoff suspended solids concentrations. The data from the leachate testing indicated that the release of organics (PAHs & PCBs) is very low.

77. In 1987, the USACE contracted the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) to conduct a sediment sampling program designed to investigate the dispersal and deposition of sediments discharged from the GCR/IHC to Lake Michigan. Grab samples were collected from the canal, harbor, and Lake Michigan up to 5 miles lakeward from the harbor mouth. Sediments were analyzed for bulk chemical composition of selected parameters. The results indicated that contaminants were leaving Indiana Harbor and depositing into Lake Michigan.

78. In 1988, the USACE conducted two separate sediment-sampling investigations. The Illinois Natural History Survey and Illinois State Geological Survey were contracted to collect grab samples from the IHC and adjacent Lake Michigan for bulk analysis, survey of benthos, and for a series of toxicity screening tests along with a biological survey and tissue-burden testing of aquatic organisms. The results of these tests indicated a high level of sediment elutriate toxicity at all IHC and vicinity stations sampled.

79. In 1990, the USEPA collected core samples from six locations in the Indiana Harbor and Canal area. Only five of the samples were collected from within the boundaries of the Federal navigation channel. All of the samples were tested according to the (Toxic Characteristic Leaching Procedure) TCLP test protocol. All of the parameters measured in the samples were below the regulatory levels given in the TCLP protocol, except for one parameter in one sample. In the sample collected outside the federal channel the level of benzene, as determined by the TCLP analysis, exceeded the regulatory level (the sample was measured at 1100 ug/l, exceeding the 500 ug/l limit). Due to this exceedance in a sample in close proximity to the Federal channel, a second set of samples was collected from the IHC in 1991. Twelve samples were analyzed according to the TCLP methods, with no exceedance, or "failures," being discovered.

80. In June 1992, the USEPA collected sediment core samples from 14 locations within the Federal channel. The purpose of sampling was to determine the characteristic nature of the sediment using the TCLP test. The sediment was analyzed for metals, volatiles, semi-volatiles, and pesticides; TCLP analysis of the sediment leachate included metals, volatiles, semi-volatiles, pesticides, and herbicides. All the TCLP parameters of the samples were below the applicable regulatory thresholds except for the benzene concentration in one sample. Since the analytical result could only be estimated because of a laboratory error, a regulatory determination could not be made based on the analysis. However, USEPA/IDEM determined that the portion of the

sediment within the navigation channel associated with this sample was "presumptively hazardous" and therefore, will not be dredged by the USACE as part of the navigation project; unless further re-testing clarifies that the sediment within this area does not exhibit the hazardous waste characteristic of toxicity for benzene. Additional sampling will be conducted as discussed in paragraph 15.

81. In November 1993, the USEPA contracted the USACE (Chicago District) to collect core samples from the Calumet River Branch of IHC. Samples were collected from four locations below project depths. Each core sample was subdivided to develop a vertical concentration profile. Bulk chemistry and the TCLP test were performed for metals, nutrients, and organics. The chemical characteristics of sediment below project depth in the Calumet River Branch are similar to the sediment above project depth with the exception of chromium. The levels of chromium appear to increase somewhat with increasing depth. Sediment depth probings were performed to determine the depth to till. The soft unconsolidated sediment extended down to -30 to -40 Low Water Datum.

82. In November 1995, Patrick Engineering, Inc. was contracted by the Chicago District to sample eight monitoring wells (MW-1, MW-5, MW-26, MW-29, CE-101, CE-103, CE-104, and CE-106). The wells were located around the perimeter and in the center of the site. All but one well was screened in the shallow aquifer to a maximum depth of 28 feet; the deep well CE-103 was drilled to a depth of 112 feet and screened in the till and the limestone. The samples were analyzed by ARDL of Mt. Vernon, Illinois and analyzed for semi-volatile and volatile organic compounds, PCBs, metals, oil and grease, ammonia-nitrogen, cyanide, and total phosphorus.

Volatilization Study

83. As part of the Environmental Impact Statement (EIS) for the Indiana Harbor and Canal maintenance dredging and disposal activities a General Conformity Determination and Odor Analysis was completed. In order to estimate the Volatile organic compound (VOC) emissions, or ozone precursors from the dredged material, mathematical models were used. These models describe the movement of chemicals through the environmental media (soil, sediment, water, and air). They are "screening level" models and are based on conservative assumptions which are meant to "overestimate" the actual flux of contaminate losses. In this sense, the results will indicate if further evaluation and possibly some type of engineering controls would be required to mitigate losses. However, during the timeframe of this investigation there was little information available relating estimated contaminant fluxes, using mathematical models, to measured fluxes from laboratory or pilot scale experiments. Therefore, a laboratory experiment was conducted in order to determine measured contaminant fluxes under various conditions and confirm the conservative nature of the mathematical models. The experiment was conducted by the Corps' Waterways Experiment Station (WES) and consisted of conducting five runs in laboratory scale flux chambers. The results of the experiment are documented in a Report titled Laboratory Assessment of Volatilization from Indiana Harbor Sediment dated September 23, 1997.

84. The Chicago District used the WES report to do additional analysis of the data which included comparing the experimental results to modeled results, and incorporating volatile losses for hydrogen sulfide, ammonia, and PCBs into the odor analysis that was conducted as part of the CMP. The Report is titled Indiana Harbor Volatilization and Odor Analysis dated November 1998.

85. Results of the experiment showed the highest contaminant fluxes occur with initial loading and mechanical disturbance of the sediment. Results imply that wetting of the sediment will not drastically increase emission rates. Measured fluxes were considerably lower (on average >10x lower) than modeled fluxes. Sediment physical and chemical characteristics, such as aging, porosity, and percent oil and grease probably decreased fluxes.

86. Flux rates for PAHs will be highest during initial sediment exposure (after placement) and after reworking activities which exposes underlying material. Changes in relative air humidity or sediment moisture following rainfall did not increase fluxes. Total Recoverable Petroleum Hydrocarbons (TRPH) fluxes will also be highest during and after re-working of the sediment. Increases in relative humidity of air increased flux rates for a short period. Ammonia fluxes will be significant during initial exposure stages not during reworking or changes in relative air humidity and sediment moisture. Hydrogen sulfide fluxes will be highest during reworking of the sediment. Fluxes may be evident during initial exposure, but may be dependent on environmental conditions. Fluxes for PCBs will be highest during initial exposure and after reworking. Increases in relative air humidity will result in a slight increase in PCB and TRPH flux rates.

87. The comparison of measured flux to modeled flux indicates that the model is conservative in that it over estimates the actual flux. On average, the results showed an exceedance of at least 1 order of magnitude (10x). For a few compounds, at low flux rates the model under-predicted volatilization, and for naphthalene during the initial time steps the model slightly under-predicted volatilization. However, given that these differences, either occurred at very low rates or were only slightly lower, and the experimental design was set up to maximize flux, the model functioned well for a screening level estimate. Therefore, the flux rates used in the odor analysis provided in the EIS are expected to be conservatively high, providing worst case analysis and verified through the experimental results.

HTRW Evaluation

88. A Hazardous Toxic Radioactive Waste (HTRW) evaluation was completed as part of the Comprehensive Management Plan (CMP)—Appendix R. The major environmental issues are discussed below. Additional phone coordination was completed as part of this DDR in order to determine if any new issues have arisen since the completion of the HTRW report. The U.S. Environmental Protection Agency (USEPA), Indiana Department of Environmental Management (IDEM), and East Chicago Waterway Management District were contacted in June of 1999, to determine if any changes had

occurred or new regulatory issues been identified at the ECI site since completion of the CMP. No changes or new issues were identified.

89. The presence of HTRW and other contamination at the ECI site is well known. ARCO, Inc. and the City of East Chicago have documented the presence of petroleum contamination. Although construction of the CDF at the ECI site may introduce some added liability that would not be involved in construction at a clean site, it seems likely that this liability will be offset by significant cost savings in engineering and constructing the CDF, and complying with regulatory requirements.

90. The presence of the HTRW should not significantly impact the design, construction, or operation of the CDF, although it is likely that workers will be required to wear personal protective equipment during construction. Personal protective equipment will also be required during the dredging of the harbor and filling the CDF and possibly for monitoring activity, but this is a result of the nature of the sediment and not the location of the CDF.

91. Northwest Indiana is a heavily industrialized area. Building a CDF for Indiana Harbor sediments, some of which are regulated under the Toxic Substances Control Act (TSCA) due to PCB concentrations, in a clean area is less desirable than constructing the CDF at the ECI site for two reasons:

a. The USEPA and the IDEM have already indicated that if the CDF is built at a noncontaminated or "green" site, stringent liner and collection systems will be required at substantial additional cost. In addition, the USEPA and the IDEM have already demonstrated that they favor the plan to construct the CDF at the ECI site.

b. Building a CDF at a clean site would place contaminated material on one of northwest Indiana's few remaining green areas, and based on the demographic layout of the area, possibly bring contaminated material closer to a residential area. In contrast, building the CDF at the ECI site keeps the Indiana Harbor sediment in an industrial area and will not consume one of the few remaining green sites.

92. The ECI site is located in a prime location for construction of a CDF, based on proximity to the dredging location and ease of transporting the dredged sediment. The liability associated with loss of TSCA contaminated sediment during transport to the ECI site is significantly less than the liability associated with transporting the sediment over land to a more distant site.

93. Since the ECI site will be contained using a cutoff wall and a maintained inward gradient, the risk of migration of sediment related contaminants is very low. In addition, since the cutoff wall and CDF are part of the RCRA Closure plan for the ECI site, it seems unlikely that regulatory agencies would score the site under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) or attempt to remediate the site under some other authority.

94. In addition to disposal of dredged material from the Federal navigation channel, materials excavated from the Inland Steel Company and LTV Steel Company berthing areas is also expected to be placed in the CDF. Dredged materials generated from the Inland Steel Consent Decree sediment remediation activities would be disposed of in the CDF as well. Any potential problems that might arise could be dealt with cost effectively, and the cost would be spread out among all the parties involved.

DESIGN

Dikes, Cap and CDF Layout

Clearing and Grubbing

95. The site shall be cleared of all obstructive matter above the natural ground surface. This includes, but is not limited to trees, fallen timber, brush, vegetation, abandoned structures and similar debris. The site shall be grubbed of all stumps, roots, buried logs and objectionable matter. All material can be temporarily stockpiled on-site until it is permanently disposed of in the CDF.

Stripping

96. After clearing and grubbing, the site shall be stripped approximately 1.3 feet. All stripped material is to remain on site for use in constructing interior dikes and grading within the CDF. Any hazardous material or construction debris encountered during the stripping process can be temporarily stored on-site and disposed of permanently in the TSCA cell.

Existing Well Decommissioning

97. Existing wells located within the project site that will not be used either for monitoring or extraction during the projects operation shall be decommissioned and abandoned in place.

Drainage Ditch

98. The drainage ditch will be installed along the perimeter dikes and is intended to control the surface run-off from the exterior CDF. The sizing of the ditch is based on a 25-year storm event during closed conditions or after the RCRA cap is in place.

99. The two drainage ditches (running along the southern and eastern portions of the site) will meet at the southeast corner of the site and transition into a culvert that outlets to the Lake George Canal.

100. Crossings will be installed across the drainage ditch to allow for access to the access roads in the northern and southern portion of the site, the access ramp in the southwest portion of the site and the entrance to the project located on the east side of the site. The culverts will consist of reinforced concrete pipe (RCP).

101. The perimeter dike consists of a structural fill which provides stability for the containment of the dredge sediments and a liner which serves as a low hydraulic conductivity barrier ($K=1x10^{-7}$ cm/sec or less) to the movement of contaminants beyond the CDF. The dike structural fill and liner can be the same or different material.

Dikes

102. The perimeter dike exterior slope is a 3 horizontal to 1 vertical slope. The interior slope is a 1 horizontal to 1 vertical slope. The perimeter dikes will be constructed in two stages and the final interior height of the dike will be 33 feet. A 25-foot wide crest is provided for access road for the facility construction vehicles. Minimum factor of safety for the analysis is 1.3 for the end of construction condition. Foundation analysis showed a minimum factor of safety against bearing capacity failure is 4.3. Settlement analysis indicated that approximately one foot of settlement in the foundation could be expected based on the embankment loading. For further information on the foundation analysis, see Appendix A, Attachment A-1.

RCRA Cap

103. From bottom to top, the cap consists of a three feet thickness of compacted soil with a hydraulic conductivity of $k=1x10^{-7}$ cm/sec or less, a six inch thick sand drainage layer, and a vegetation layer consisting of a two foot thick clean fill layer overlain by a six inch thick topsoil layer with a grass cover. To promote drainage off of the CDF a minimum three percent top slope is specified.

104. The same cap sequence or equivalent used for the CDF will be used for the RCRA cap on the buffer areas. The buffer area is anything inside the property boundary but not beneath the CDF or the perimeter dikes.

Borrow Site

105. The borrow sources have yet to be determined for any of the materials. Details about the use of alternate material for dike structural fill and their borrow sources will be provided during the preparation of plans and specifications for the dike layout.

Disposal Site

106. The contractor will be responsible for the appropriate disposal of all material on-site and will not dispose any material off-site except with the approval of the Contracting Officer.

Haul Routes

107. It is not anticipated that any existing haul roads will require improvements or repair due to construction traffic and loading. Repairs will be made if roads do become damaged due to the hauling of material. The Contractor will be required to obtain all necessary permits for the routes.

Staging / Storage Areas

108. Permanent staging / storage areas are provided in the southeastern portion of the site. Temporary staging/storage is available in any area within the CDF footprint prior to the construction of that area's perimeter dike walls.

Access Ramps

109. Ramps are provided for access to the haul roads on top of the dikes in the southwest portion of the site along side the southwest cell perimeter dike wall. The access ramps shall be constructed out of the same material as the perimeter dike walls and at a 10%grade. Each access ramp will handle 1-way traffic. One ramp will be designated for traffic onto the top of the dike walls and one ramp will be for traffic off the top of the dike walls.

Groundwater Protection System

110. The groundwater protection system will consist of a system to create and maintain an inward gradient onto the ECI Site. This system will have two primary components, a low-permeability barrier (groundwater cutoff wall) around the perimeter of the site to minimize the movement of groundwater into and away from the site and a gradient control system to maintain the inward gradient. The preliminary design of this system is discussed in Appendix B - Groundwater Protection System. A design analysis will be performed, including the development of a groundwater model, before preparation of plans and specifications for construction.

Groundwater Cutoff Wall

111. The groundwater cutoff wall shall consist of a low-permeability barrier that will penetrate completely through the sand layer underlying the site. The wall will be approximately 33 feet deep and keyed into the silty clay below the sand a minimum of 3 feet. The methods and materials will be left to the construction contractor, with the cutoff wall having requirements of having permeability less than $1x10^{-7}$ cm/sec and being inert with respect to the contaminants found on-site and in the dredged materials. For the purposes of preparing a cost estimate, a Vibrating Beam method appears to be the most cost effective.

112. Prior to installation of the groundwater cutoff wall, an inspection trench will be excavated along the wall alignment. The purpose of this trench is to remove obstructions that would hinder the installation of the wall and to identify any and all potential utilities that may still be active.

Gradient Control System

113. The gradient control system consists of a series of extraction wells that will drawdown the groundwater within the area contained by the groundwater cutoff wall. The wells will maintain a minimum drawdown of 2-feet on the interior of the cutoff wall. Approximately 110 extraction wells will be located around the perimeter of the site and pump the collected water to the Effluent Treatment System described below. A series of monitoring wells will be located outside of the cutoff wall to determine the elevation of the water outside of the cutoff wall. This information will be used to decide on turning the pumps on and off in the extraction wells. The number of wells will be determined as part of the design analysis for the groundwater protection system, after development of a groundwater model.

Effluent Treatment System

114. The design of the wastewater treatment system needed for treatment of effluent from the CDF required that treatability studies be conducted to screen, evaluate, and test potentially viable treatment options. The Chicago District accomplished this task using a two-phase approach. The first phase was to evaluate treatment options, using existing information and completing an analysis based on a literature review and in-house experience with similar systems. The second phase involved collection, processing, and evaluation of potential treatment options, which were screened in the first phase. Treatment options were evaluated at the "bench-scale" in the laboratory.

115. Appendix D discusses the results of treatability testing completed in order to determine the effluent characteristics and treatment requirements for the design of an on-site treatment facility. The facility will process water from three (3) different sources. These include effluent from pore water released from the deposited sediment (#1), precipitation run-off (#2), and water from the groundwater gradient control system (#3). The final effluent from the treatment system will be discharged to the Lake George Branch of the Indiana Harbor and Canal (IHC). As part of the treatability testing, each of the aforementioned (#1-#3) wastestream(s) were evaluated. In addition, a combined wastestream (#4) incorporating anticipated volumes of the previous three wastestream(s) was also evaluated. This last wastestream (#4) provides the characteristics of what is likely to be processed through the treatment system, since it is anticipated that the other wastestream(s) will be combined prior to treatment. The design of the treatment facility will be completed during the preparation of the Treatment Plant DDR.

116. The treatment train evaluated included: flow equalization, oil/water separation, sand filtration, cyanide removal (alkaline chlorination), chemical precipitation, biological treatment, activated carbon adsorption, and ammonia stripping. The results of the treatability study indicate that preliminary separation/settling is a key mechanism for the removal of POCs at the head end of the proposed treatment system. In most cases, the final effluent qualities produced by the tested treatment train did comply with conservatively based discharge criteria.

117. As a result of the study it was found that some of the aforementioned unit operations/processes were not needed, and therefore, the recommended treatment train, for the project includes: flow equalization w/oil skimmer, chemical precipitation, biological treatment, sand filtration, and activated carbon adsorption.

118. It is anticipated that the treatment train selected for the CDF effluent will be able to handle wastestream variability through the use of extra detention time in unit operations/processes (equalization basin, biotreatment), with extra chemical (chemical precipitation), and extra filtration media (activated carbon, sand filtration). In addition, operation attention and laboratory analysis will have to be used to closely monitor influent wastestream and resultant effluent water quality. If there is a wide variability in POCs over time, modification of the treatment train configuration may have to be considered. In this sense treatment of the resultant wastestream(s) will be an on-going learning process. The knowledge gained through the operation of the full-scale system will direct operators on how to respond to changes in wastestream characteristics. Given the variability inherent in the nature of this project, it is recommended that the designed treatment system be modular so that unit operations can be added, taken out of service, or bypassed as required.

Dredging and Placement Plan

Description of the Dredging Operation

119. Available dredging technologies were examined and their feasibility for the Indiana Harbor project was discussed in Appendix H (Dredging Technologies and Impacts) of the Comprehensive Management Plan (CMP). Based on this analysis, it was determined to use a mechanical dredge, specifically a closed-bucket clamshell dredge.

120. Sediments excavated with a mechanical dredge are placed into a barge or scow. The loaded barge or scow is transported to the CDF and is docked by the rehandling area. Prior to transferring the dredged material from the barge or scow, excess water will be decanted from the barge or scow and pumped or transported to the effluent treatment facility.

121. Several environmental controls are recommended for the IHC dredging. These controls include the use of closed-bucket clamshells to reduce the resuspension of sediments; deployment of oil booms when oil slicks are produced by the dredging; and use of adsorbents to remove oil and grease contained by the oil booms. The sorbent materials will be disposed with the dredged materials as appropriate.

Rehandling of Dredged Material

122. At the CDF rehandling area, the dredged material will be loaded into trucks from the barges/scows. A crane or a clamshell can be used for the loading procedure but provisions must be made to contain and control any spills. The specific transfer system will be proposed by the contractor and is subject to approval by the contracting officer.

Structural Features of the Docking Facilities

123. The project structural features include the slab design that will support the operation of a crane or a clamshell and other equipment such as a hopper. The spilled contaminant can be collected in the slab with a curb along its perimeter and drained into a sump. The contaminant effluent will be sent to the onsite treatment facility before it goes back to the canal. Timber fenders will be installed along the existing steel sheet pile to provide bumpers to the barge during berthing. The slab will be founded on soil and H-piles, and will be designed as a flat plate.

Transportation of Dredged Material

124. Trucks will transport the dredged material to the CDF by use of haul roads placed on the perimeter dikes of the CDF as well as haul roads on top of the interior and sub-cell dikes. Alternate methods of transport, such as use of a conveyor system or pumping through pipes, may be considered during the detailed design phase. Once placed in the CDF, the dredged sediment material will be managed to promote drying and consolidation.

Dredged Material Placement

125. Dredged material will be placed in the CDF in lifts of approximately 3 feet during any placement period. Such limited lifts will promote greater efficiency of the natural drainage/drying processes and greatly enhance potential gains in CDF capacity through consolidation. Lifts will continue to be placed until 3 to 4 feet of freeboard remained, at which time the perimeter dikes will be raised. An estimate of anticipated annual dredging requirements for the period of analysis is given in table E-2, Appendix E.

126. Lifts will either be placed on the bottom if possible or dumped from the edge and mechanically distributed if necessary. Each cell shall be graded towards a decant structure to aid in dewatering the dredged material. An underdrainage system should be constructed prior to or at the same time as the initial placement. To aid in the placement of material and to prevent degradation of haul road edges, short spur dikes (approximately 20’ long) shall be constructed as needed off of the haul road.

Sub-Cell Dike Construction

127. Each main cell is divided into sub-cells by constructing sub-cell dike walls connecting to the three main cell's (the north cell, southwest cell and the southeast cell) perimeter dike walls. The sub-cell dikes are constructed using dried dredged sediment material. Sub-cell dike construction sequencing shall be similar to that for dredged material placement.

Decanting

128. Once the dredging operation period is completed and in conjunction with the trenching described below, ponding water must be removed to promote drying and consolidation of dredged material during the drying period of the cycle. The stop logs in the decant structure shall be removed one row at a time to slowly decant the ponded water. Prior to the placement of the next level of dredged material, stop logs shall be replaced to the appropriate height.

129. Liquid collected at a decant structure will be piped to a central sump. From the central sump, the liquid will be piped to the equalization basin and then to the treatment facility prior to discharge to the canal.

Trenching and Underdrainage System

130. A combination of perimeter trenches, parallel interior trenches and a gravity-assisted underdrainage system will assist the dewatering process. All piping and trenches will direct the water to and tie into the decant structure located in each sub-cell. Liquid collected at a decant structure will drain by gravity through pipes to a central sump. From the central sump, the liquid will be pumped through a riser pipe to the extraction well piping system and then to the equalization basin where it is transferred to the treatment facility prior to discharge to the canal. For further information see Appendix E, Decanting.

131. The underdrainage system will be installed on the base of the cell. The system shall consist of perforated drainage pipe surrounded by a suitable filter. The piping system should bisect the sub-cell starting from the decant structure to the high side of the sub-cell. As considered necessary, piping may be incorporated into the dredge material as the elevation of the cell is raised to expedite drainage.

132. Immediately upon completion of placement of that cycle's 3-foot lift within a cell, a wide and shallow perimeter trench shall be dug. The trenches will allow the dredged material near the trench edge to dry slightly faster than material located farther out in the cell and a crust will form. As the crust thickness grows, the ditches shall be dug to deeper depths. After an appropriate minimal crust thickness has formed because of the perimeter trenching, trenches shall be constructed towards the interior using the same shallow trench technique. The trenches shall be placed parallel to each other and constructed so that runoff is directed to the perimeter trenches where the water is directed into the decant sump.

Railroad Relocation

General

133. The CSX Transportation Railroad Relocation is being performed as part of the Indiana Harbor and Canal (IHC) and Confined Disposal Facility (CDF) project. The CDF plan includes construction on a portion of the ECI property, which is separated by a 100 feet wide, multiple railroad track ownership/easement corridor. Most of the corridor was abandoned and is presently in use by one lead/side track operated by CSX Transportation. This lead track will be relocated to the northern portion of the site to maximize an optimal dredged sediment placement plan that provides a more economical and constructable CDF design.

Ballast System and Roadbed

134. The designed ballast system consists of a 9 ½ foot wide standard A.R.E.A. size 4-A ballast on a compacted 12" minimum sub-ballast with a 20-foot wide crest and 2H: 1V side slopes in typical cut cross-sections. Geotextiles are not required. In fill cross-sections, the sub-ballast crest widths vary. The crest width allows for a walkway extended from the centerline of the track on both sides.

135. The subgrade shall be compacted and finished so that it directs water away from the track. The design slope is 2% from the centerline of the track on both sides.

Drainage Ditch

136. The drainage system is sized to carry drainage without ponding of water against the roadbed. The ditch is designed to contain the drainage water as it filters into the site as normal. Drainage shall not be diverted, directed toward CSXT, or increased in quantity without prior approval and agreement with CSXT. Track roadbeds fills shall not be used as dams or levees for retention of water nor shall CSXT ROW be utilized for retention or settling basin.

137. The designed side slopes of the drainage ditch are 3H:1V with a 2-foot depth and 3-foot bottom width for constructability. The profile was also raised so that the entire typical section is above the existing ground line.

Rail Track System

138. The rail track system consists of the track line rails, ties, plates, spikes, anchors, and appurtenant supports. The controlling elevation was the existing track elevations at the west and east ends of the project site. Curve information for each curve includes the intersection angle, degree of curve, radius, tangent distance, external and length of curve.

Horizontal Curves, Vertical Curves and Grades

139. Trackage was designed using the minimum degree (maximum radius) of curve practicable. Track grades are to the minimum possible, consistent with terrain requirements. Grades were carefully designed to ensure that motive power available will handle the tonnage to be moved. This takes into consideration number of cars, whether loaded or empty, etc. Grades for “Load / Unload in Motion” trackage were designed so that a train is under power with no bunching of couplers while loading or unloading. Frequent changes of grade were avoided. Vertical curves were provided at all grade changes, and were as long as practicable. Neither grade changes nor vertical curves are within the limits of switch ties.

140. The track profile was also adjusted to allow for the design and construction of a 3’ RCRA cap underneath the relocated track within the R.R. ROW. This RCRA cap is part of the total cap for the RCRA site and continues the encapsulation at the R.R. relocation.

Staging/Storage Areas

141. Staging/storage areas are provided within the existing CSXT Right –of-way (ROW). Details will be finalized during the preparation of plans and specifications.

Monitoring Program including RCRA/TSCA

142. Appendix G describes the general contents of the plans that will be developed for monitoring during dredging; monitoring during the construction, operation, maintenance, closure, and post-closure care of the CDF on Parcels IIA and IIB; and monitoring during the construction of the cap, closure, and post-closure of Parcel I of the ECI facility at Indiana Harbor. The plans will cover the closure and post-closure care of the RCRA hazardous waste units that were located on Parcel I, corrective action activities associated with Parcels II A and II B, and TSCA issues associated with the project.

143. Given the unique nature of this project, which is regulated by multiple environmental regulations including RCRA, TSCA, and the CWA, a memorandum of understanding (MOU) is currently being developed with USEPA and IDEM. This MOU is designed to provide the overall legal and technical framework by which the parties will construct the CDF; complete the dredging; place the dredged material in the CDF; and upon completion of the project, close and monitor the CDF in accordance with all applicable legal requirements. In lieu of a RCRA permit, this MOU will serve to delineate the aspects of RCRA closure/corrective action requirements.

144. The following is a list of the categories of plans that are discussed in Appendix G: construction plans; operational plans; maintenance plans; environmental protection plan; health and safety plans; inspection and contingency plans; personnel training plans; and data management plans. In addition, the Corps produces an Operation and Maintenance (O&M) Manual for all CDF projects. The O&M manual for this CDF will contain descriptions of operation and maintenance activities. A paragraph follows with a short description of each of the plan categories.

145. The CDF disposal cells, cutoff wall, treatment facility, rehandling area, and groundwater extraction wells will be constructed in strict accordance with the plans and specifications prepared by the owner (ECWMD)/operator (USACE), and approved by the appropriate agencies including, but not necessarily limited to USEPA and IDEM. Prior to the construction, the owner/operator will prepare Construction Plans addressing: the RCRA closure cap for Parcel I; the cutoff wall and groundwater extraction system for Parcels I, IIA, and IIB; the treatment system for groundwater collected from the gradient control system, pore water from the dredged material, and precipitation run-off within the CDF; the rehandling area for transfer of dredged material from barges to the trucks; and the CDF disposal cells and a final cap.

146. The operation of the CDF and the containment and collection systems involve a number of separate, but coordinated functions. These include dredging, rehandling, placement of dredged material, dewatering, groundwater gradient control system, and collection and treatment of wastewater. The Operational Plans will cover the activities in the above functions. Operation monitoring will occur during and after each dredging and disposal event. The frequency of dredging operations may occur every year or once every several years while the operation and monitoring of the effluent treatment and gradient control systems will occur on a regular basis. The following will be identified in the operational plans as requiring monitoring: the surface water around the dredge; air(ambient and worker); the gradient control system, and discharge from the treatment plant.

147. Maintenance Plans will be included for activities such as management of vegetation and wild life and maintaining site security. Although the detailed schedule for these activities has not been established, the frequency will be greater during the active life of the project and less frequent during the post-closure care period.

148. The Environmental Protection Plan will document how all applicable federal, state, and local environmental laws and regulations will be followed. The plan will describe ways in which to safeguard the environment from damage or potential impacts resulting from construction, operational, and maintenance activities.

149. A Health and Safety Plan (HASP) will be written to cover both the construction and operation activities. The HASP for construction activities will detail methods designed to reduce and ameliorate accidents that could occur during construction. This plan will consist of two components. The administrative safety plan identifies personnel responsible for ensuring that on-site safety precautions are implemented. A hazard analysis is also performed on site conditions that may pose safety hazards and ways to avoid accidents. The operational HASP will include the various monitoring activities that will be undertaken in connection with the dredging and disposal operations, personal protective equipment and decontamination of workers. The monitoring program will be based upon the analysis of environmental data collected in the project area, which should include: high-volume air sampling conducted at various locations throughout the project area; personal air monitoring; and representative sampling and chemical analysis of the sediment.

150. Inspection and Contingency Plans will be developed. The owner/operator or its representative shall inspect the facility for malfunctions and deterioration, operator errors, and discharges, which may be causing, or may lead to, a release of hazardous waste constituents to the environment, or a threat to human health. The areas of inspection will include maintenance, construction, rehandling, and dredging equipment. A contingency plan and emergency procedures will also be included in this group of plans.

151. A Personnel Training Plan will be created that complies with any applicable requirements of RCRA, TSCA and Occupation Safety and Health Act (OSHA). Facility personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with any applicable requirements of RCRA, TSCA, and any other laws or rules.

152. Data Management Plans will provide the manner of recording and maintaining the facility operating record until closure of the facility. The following records will be included: dredging records, construction records, operation records, monitoring records, and maintenance records.

RCRA LIABILITY

153. Under existing RCRA regulations both the owner of the ECI site, presently the East Chicago Waterway Management District, and the U.S. Army Corps of Engineers would be considered operators of a RCRA facility for the CDF being constructed on the ECI site. However, in his September 17, 1998 memorandum the Assistant Secretary of the Army for Civil Works indicated that any additional response actions (beyond the CDF ECI site development features) for containments regulated under the Comprehensive Environmental Response, Compensation, and Liability Act should not be considered dredged material disposal features but should be a non-Federal responsibility. Accordingly, provisions are to be included in the project cost sharing agreement for this project, which make additional response actions a non-Federal responsibility.

154. While the likelihood of a significant leak of contamination from a well designed, constructed and managed CDF is remote, the Chicago District has evaluated the worst case financial liability associated with construction of a CDF at the ECI site.

155. If after construction and operation of the CDF began, it was determined that some contamination was migrating off-site through the cut-off wall, the worst case mitigation requirements that would be required if the cut-off wall experienced a major, widespread failure, construction of another cut-off wall around the perimeter of the existing one could be undertaken as the mitigation measure at a cost of approximately $6.6 million. If the cut-off wall experienced a limited failure, the point of failure would be located and isolated repairs undertaken or the inward gradient control pumpage could be increased at much less cost.

ENVIRONMENTAL ANALYSIS/ENVIRONMENTAL IMPACTS

156. A wildlife exclusion plan will be developed to prevent or minimize adverse impacts to wildlife during disposal operations at the ECI site. The plan will be developed in consultation with the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture, and the Indiana Department of Natural Resources.

157. In other respects, the proposed project is in full compliance with the National Environmental Policy Act (NEPA), Fish and Wildlife Coordination Act, Endangered Species Act, National Historic Preservation Act, Clean Water Act, and Clean Air Act.

OPERATION AND MAINTENANCE ACTIVITIES FOR THE CDF

158. The operations and maintenance activities for the CDF include placement of the dredged material in the CDF, management of dredged material within the CDF to promote drying and consolidation of the dredged material (trenching, placing underdrainage system with additional lifts), and running the effluent treatment system and gradient control system. Dredging and transporting of the dredged material into the rehandling area is not part of the operations and maintenance activities. The O&M costs will be divided proportionally between the Corps and non-Federal sponsor according to the annual volume of sediment dredged from the Federal and non-Federal channel, respectively.

159. An O&M manual will be developed to outline these activities. Examples of some of the activities include:

a. CDF Dikes, Cap, and Management of Dredged Material

   i. Haul and place dredged material

   ii. Construct sub-cells

   iii. Place trenches and underdrainage system

   iv. Costs for labor and power

   v. Water haul roads to minimize dust and wind erosion

   vi. Maintain equipment (i.e. trucks used during disposal; amphibious vehicles, draglines, pontooned backhoes or other equipment used for sub-cell trenching)

vii. Seeding, erosion-control, and maintain slope stability on perimeter and interior dike structures; mow the grass on the perimeter dikes and buffer area

viii. Maintain integrity of six foot cap consisting of clay, sand, clean fill, and seeded topsoil

b. Gradient Control System

i. Costs for operating the system such as labor and power

ii. Verify the pumps are working properly and repair and replace when needed.

iii. Check the valves and water level indicators every 6 months.

iv. Check the manual controls on the pumps every 6 months

c. Effluent Treatment System

i. Costs for operating the system such as labor and power

ii. Backwash sand filter.

iii. Replace spent activated carbon.

iv. Maintain chemical addition system for chemical precipitation unit.

v. Maintain pumps, instrumentation, skimmer, and sludge/bottom solids collection equipment.

160. For the costs incurred by the Corps, most of the activities will be included in the maintenance budget. The only operations costs are the costs incurred from operational maintenance of the CDF. These are the activities that are of a recurring nature. This includes activities such as custodial services; removing snow and trash; relamping light fixtures; placing signs; painting of guardrails; and wildlife and vegetation management (i.e. mowing grass, cutting down vegetation).

REAL ESTATE REQUIREMENTS

161. The total land acreage required for this project is 164.24 acres. The CDF will occupy 134.19 acres, while a Rehandling and Treatment area will occupy the remaining 30.05 acres. The Non-Federal Sponsor, the East Chicago Waterway Management District currently owns in fee 208.36 acres on or near the project area. Of that, 164.24 acres will be used for the project.

Regulatory Summary

Permitting

162. Given the unique nature of this project, which is regulated by multiple environmental regulations including Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), and the Clean Water Act (CWA), the need for an agreement to facilitate the completion of the project became apparent to the regulating agencies and the Corps. This agreement, specifically the Memorandum of Understanding (MOU), will outline the regulatory framework applying to the project.

163. The MOU is currently being developed between the Indiana Department of Environmental Management (IDEM); U.S. Environmental Protection Agency, Region V (USEPA); East Chicago Waterway Management District as local sponsor of the project; and U.S. Army Corps of Engineers, Chicago District (USACE). This MOU is designed to provide the overall legal and technical framework by which the parties will construct the CDF; complete the dredging; place the dredged material in the CDF; and upon completion of the project, close and monitor the CDF in accordance with all applicable legal requirements. In lieu of a RCRA permit, this MOU will serve to delineate the aspects of RCRA closure/corrective action requirements. The details of these activities will be incorporated into the project during preparation of the Regulatory Requirements Report. The activities will cover the closure and post-closure care of the RCRA hazardous waste units that were located on Parcel I, and corrective action activities associated with Parcels II A and II B upon which the CDF will be built. The activities will also address TSCA issues associated with the project.

164. USACE has been coordinating the requirements for permits or applications with IDEM and USEPA. At a minimum, the following permits or approvals will be necessary: TSCA, Section 402 of the CWA, and Facility Construction. As recognized by all the parties, the CDF final cap will not be installed until approximately 30 years after dredging begins. The MOU will serve as the permitting mechanism for the RCRA closure and corrective action at the site. The Section 402 permit will be a combined Stormwater and National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permit will be needed to discharge the treated effluent from the facility to the canal; the Facility Construction permit is necessary for the wastewater treatment plant. IDEM is currently reviewing Appendix V of the CMP (General Conformity) for the air quality impacts and the Section 404 (b) (1) Evaluation in the EIS for water quality impacts.

Regulatory Issue

165. In 1998 the USEPA published final rulemaking on the Toxic substances Control Act (TSCA) and Resource Conservation & Recovery Act (RCRA). These two rulemakings each include language addressing dredge material. The potential ramifications with respect to this project are unclear at this time. The rulemakings could impact the project with respect to characterization requirements associated with the presumptively hazardous sediments located in the south corner of the Anchorage and Maneuvering Basin, and sediment located outside the Federal channel. Characterization of project sediment will be conducted prior to dredging. Since the dredging project will not begin prior to year 2005, additional sampling at this time will be of limited value. The results of sampling will be more representative if the sampling occurs at a time closer to the actual dredging. The intent of this sampling will be to evaluate worker health and safety concerns, to confirm TSCA sediment volumes and locations, and to determine hazardous characteristics, if at that time it is determined to be appropriate and required. Note that requirements at the time of actual dredging may be different, due to the incorporation of the new rulemaking, which could change the conclusions reached in the Comprehensive Management Plan (CMP), specifically addressed on pages 15-16, 89, and 114 concerning this issue. Furthermore, the sediment characterization plan(s) will be reviewed and approved by both IDEM and USEPA.

COSTS

166. The cost estimate shown in Table H-1 which supports the DDR, is based on the MCACES cost estimate prepared for the CMP. The total project cost is based on the CMP MCACES cost estimate escalated to the price index level of October 1999 with an inflation allowance added through the midpoint of construction. Appropriate costs for planning, engineering and design and construction management were added to the construction costs to determine the total project costs.

PROJECT SCHEDULE

167. The construction sequence for the Indiana Harbor CDF is shown on Table 2. This schedule includes the design and construction periods of work. More detailed information is included in the Management Plan.

Table 2. Project Cost and Schedule[1]

Estimated Dates	Activity	Cost ($000)
Apr 01 - Oct 01	Railroad Relocation	1,545
Sep 00 - Sep 02	Cut-Off wall	4,651
Sep 01 - Sep 03	Hydraulic Gradient	1,470
Sep 01 - Sep 03	Seal Stage 1 Dike	3,402
Sep 01 - Sep 03	Stage 1 Dike	8,271
Sep 01 - Sep 03	Seal Perimeter Areas Parcel 1	3,586
Sep 01 - Sep 03	Seal Perimeter Areas Parcel 2a & 2b	3,844
Jun 03 - Sep 04	Treatment Plant	10,677
May 13 - Dec 15	Stage 2 Dikes	13,816
May 33 - Dec 35	CDF Cap	66,426
	CDF Construction Grand Total	117,688
May 05 - Dec 05	Dredging Year 1	3,175
May 06 - Dec 06	Dredging Year 2	6,208
May 07 - Dec 07	Dredging Year 3	3,479
May 08 - Dec 08	TSCA Dredging	6,860
May 09 - Dec 13	Dredging (Yearly 2009 – 2013)	28,346
May 14 - Dec 20	Dredging	24,283
May 22 - Dec 32	Dredging	56,480
	Dredging Grand Total	128,831

Federal CDF Construction	61,100	Federal Dredging	105,000
Non-Federal CDF Construction	56,900	Non-Federal Dredging	24,000
Total CDF Construction	118,000 [2]	Total Dredging	129,000 [2]

[1] The costs are based on October 1999 price levels with an inflation allowance through the midpoint of construction.

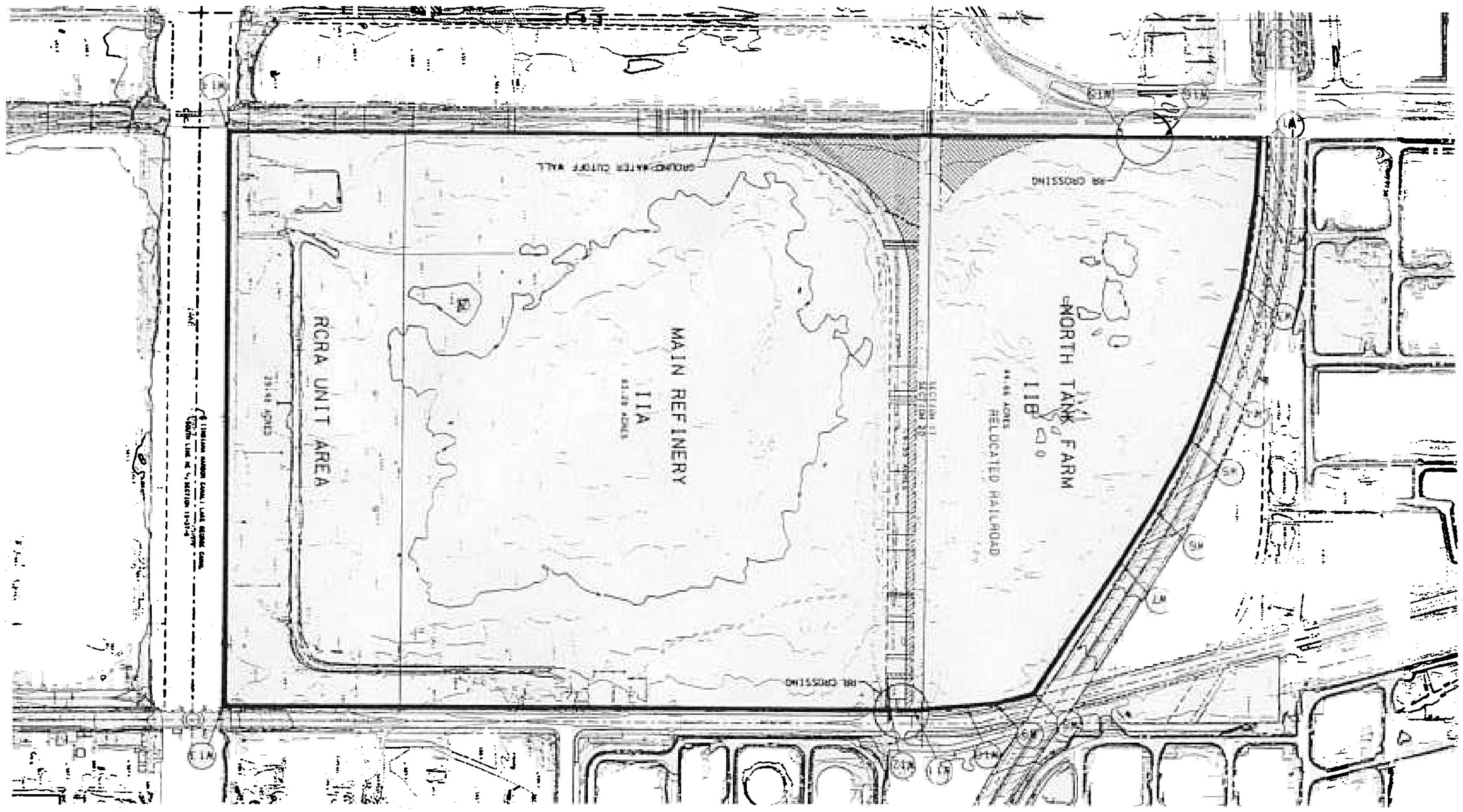
[2] Costs rounded to three significant digits. The approved cost sharing plan is delineated in the financial plan which is provided in the PCA.

RECOMMENDATION

168. I recommend approval of the Design Documentation Report. The DDR is an implementation document, in-progress, that serves as the technical basis for the plans and specifications for the Indiana Harbor CDF project in accordance with ER 1110-2-1150 and ER 1110-2-1200.

169. I certify that the subject design achieved by the pre-construction engineering and design effort is the most effective for this design phase. This certification does not preclude the use of future value engineering studies which may utilize new technologies or construction techniques or a combination of such experts which further reduce project costs.

Peter J. Rowan
Lieutenant Colonel, U.S. Army
District Engineer



PERMANENT EASEMENT		
NUMBER	NORTHING	EASTING
W1	1.514.467.0	389.213.8
W2	1.514.453.8	389.413.8
W3	1.514.404.2	389.758.6
W4	1.514.301.0	390.103.5
W5	1.514.215.8	390.322.0
W6	1.514.080.8	390.577.5
W7	1.513.957.1	390.773.6
W8	1.513.643.1	391.256.2
W9	1.513.506.5	391.290.7
W10	1.513.398.2	391.300.5
W11	1.513.207.8	391.315.3
W12	1.513.123.8	391.314.8
W13	1.510.731.1	391.304.9
W14	1.510.767.3	389.197.4
W15	1.513.986.8	389.214.4
W16	1.514.128.9	389.214.4

REAL ESTATE LEGEND

- PERMANENT EASEMENTS
- CANAL CENTERLINE
- ROAD CENTERLINE
- PROPERTY BOUNDAR

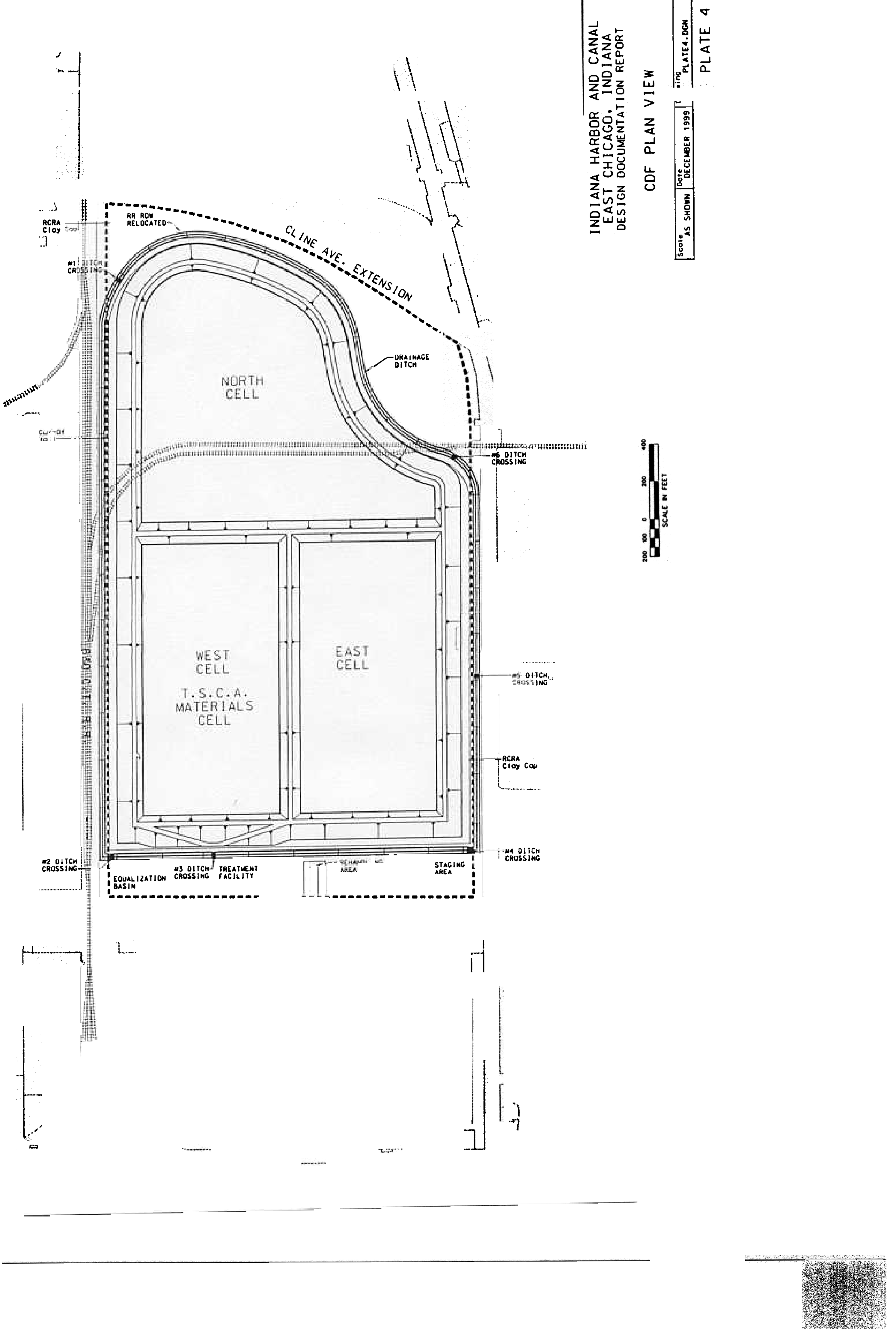
200 100 0 200 400
SCALE IN FEET

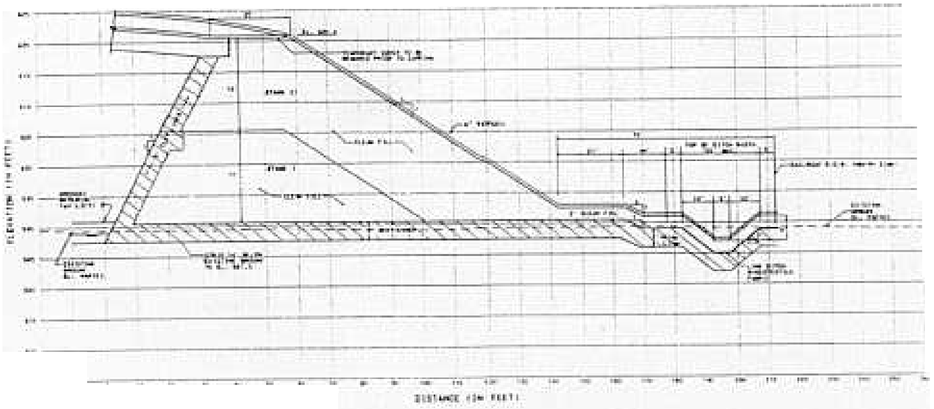
INDIANA HARBOR AND CANAL
EAST CHICAGO, INDIANA
DESIGN DOCUMENTATION REPORT

REAL ESTATE MAP

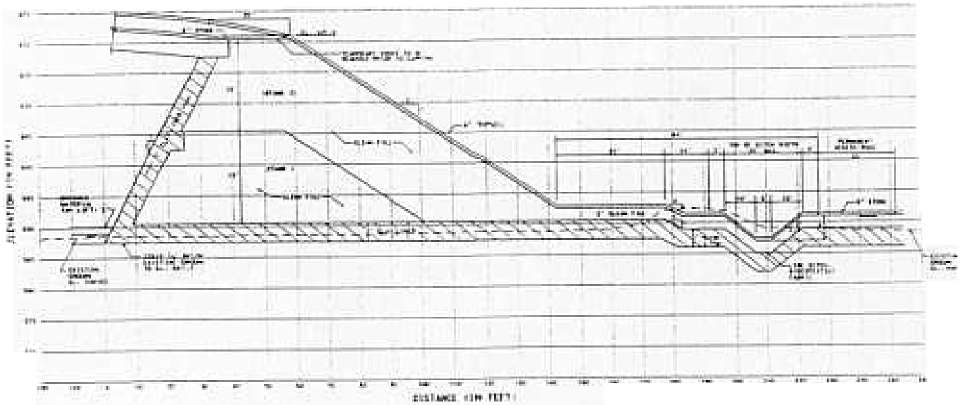
Scale	Date	Drawing
AS SHOWN	DECEMBER 1999	PLATE3.DGN

PLATE-3

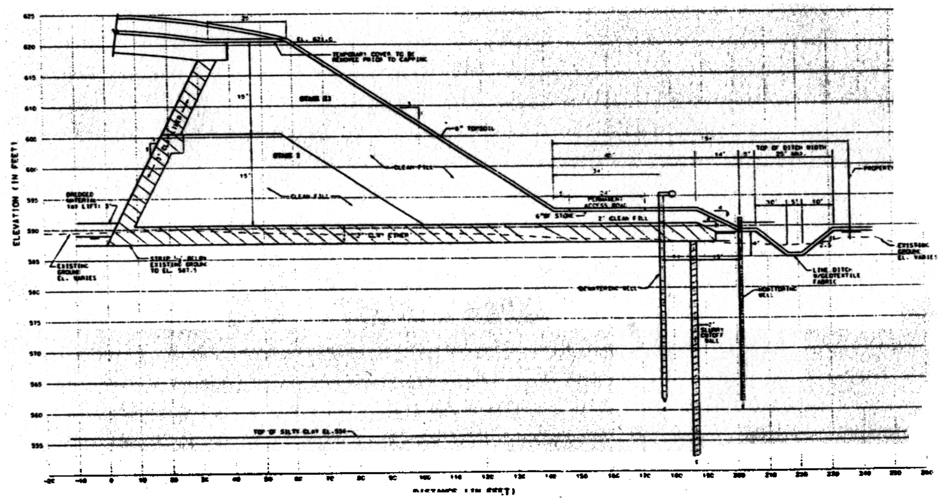

INDIANA HARBOR AND CANAL
EAST CHICAGO, INDIANA
DESIGN DOCUMENTATION REPORT
CDF PLAN VIEW
Scale AS SHOWN
Date DECEMBER 1999
PLATE4.DGN
PLATE 4
CLINE AVE. EXTENSION
RR ROW RELOCATED
RCRA Clay Cap
#1 DITCH CROSSING
DRAINAGE DITCH
NORTH CELL
#6 DITCH CROSSING
WEST CELL
T.S.C.A. MATERIALS CELL
EAST CELL
#5 DITCH CROSSING
RCRA Clay Cap
#4 DITCH CROSSING
#2 DITCH CROSSING
EQUALIZATION BASIN
#3 DITCH CROSSING
TREATMENT FACILITY
STAGING AREA
SCALE IN FEET
400
200
0
100
200



NORTH SIDE
TYPICAL DIKE & DITCH SECTION



SOUTH SIDE
TYPICAL DIKE & DITCH SECTION



EAST AND WEST SIDES
TYPICAL DIKE & DITCH CROSS SECTION

10 5 0 10 20
VERTICAL SCALE IN FEET

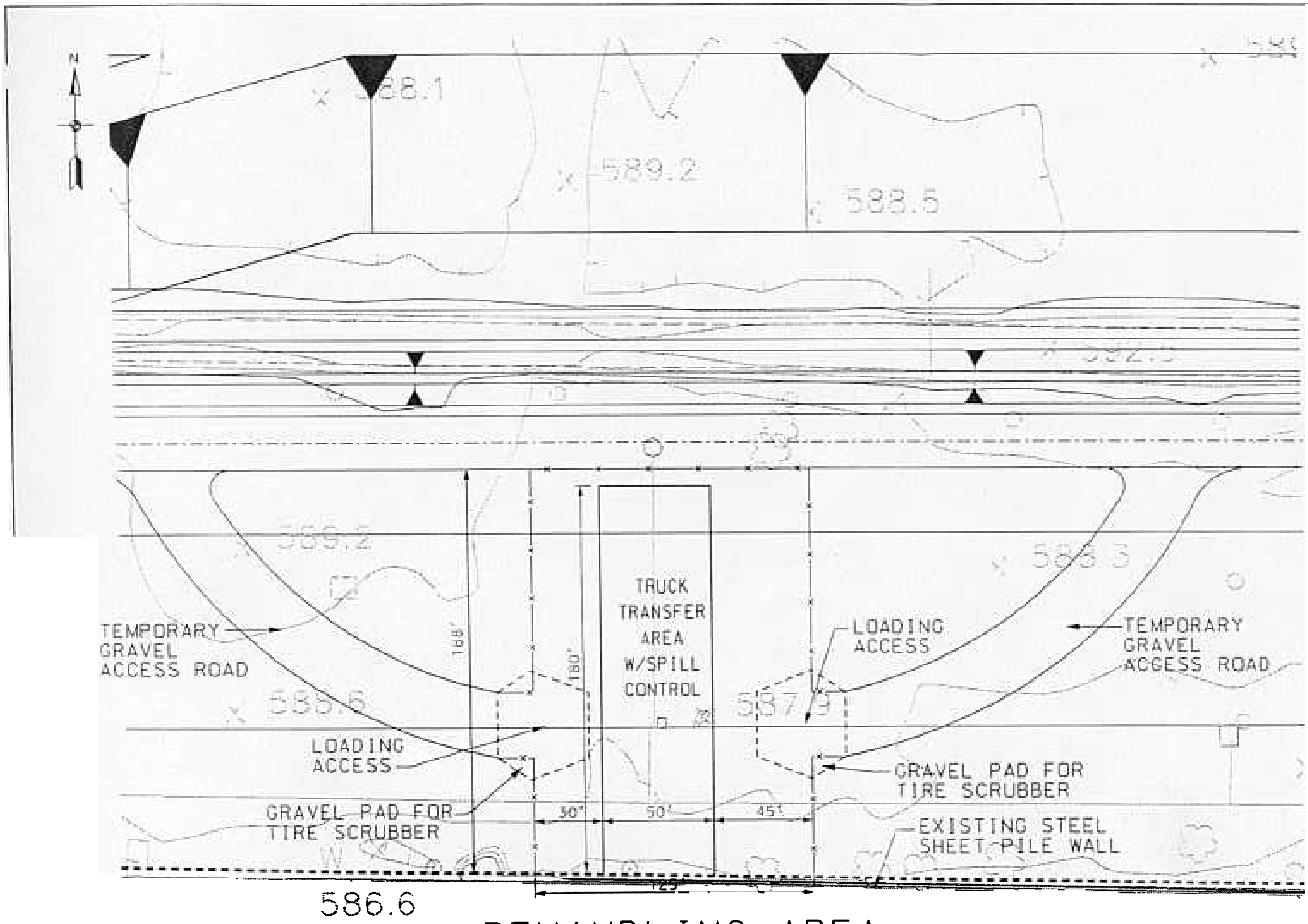
20 10 0 20 40
HORIZONTAL SCALE IN FEET

INDIANA HARBOR AND CANAL
EAST CHICAGO, INDIANA
DESIGN DOCUMENTATION REPORT

CDF CROSS SECTION

Scale	Date	Drawing
AS SHOWN	DECEMBER 1999	PLATE5.DGN

PLATE 5



REHANDLING AREA

Initial Proposal: Dated 28 MAY 98

0 25
SCALE IN FEET

INDIANA HARBOR AND CANAL
EAST CHICAGO, INDIANA
DESIGN DOCUMENTATION REPORT

PLAN VIEW
OF REHANDLING AREA

Scale	Date	Drawing
AS SHOWN	DECEMBER 1999	PLATE6.DGN