Supplemental Risk Assessment of Potential Air Emissions from the Confined Disposal Facility for the Indiana Harbor and Shipping Canal Sediment Dredging and Disposal Project

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Prepared by

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

EXECUTIVE SUMMARY

In order to maintain channel depths in the Indiana Harbor and Shipping Canal (IHSC), the United States Army Corps of Engineers (USACE) must periodically dredge the bottom sediment. The harbor was last dredged in 1972. Because the sediment contains a variety of pollutants, it must be handled and disposed of properly. USACE is currently constructing a confined disposal facility (CDF) for the sediment in East Chicago, Indiana. The site consists of about 168 acres of land and was formerly operated as an oil refinery for many years. Dredging is expected to begin in 2009 and continue for 30 years.

In September 1998, USACE submitted a Comprehensive Management Plan for the proposed construction of a CDF in East Chicago, Indiana for disposal of dredged sediments from the IHSC. This included a Feasibility Study (FS) and Environmental Impact Statement (EIS). Due to the concern of risks posed by construction and operation of a CDF, the United States Environmental Protection Agency (USEPA) conducted a risk assessment for USACE that was finalized in 1995 and included in the EIS. The 1995 risk assessment reported that the total cancer and noncancer hazard risks due to inhalation of potential emissions from the CDF are within the risk range that USEPA considers acceptable.

Because the public raised concerns about the 1995 health risk assessment and because risk assessment methods have evolved and advanced since 1995, USEPA agreed to perform additional risk study and calculations to provide additional information regarding potential exposures from the CDF. USEPA met with concerned residents and the public on several occasions to discuss the supplemental risk assessment and describe the approach that was used.

The purpose of the supplemental risk assessment (SRA) is to estimate potential health risks from the incremental emissions from the CDF. It does not attempt to estimate cumulative health risks from other existing background exposures. The methodology of the study generally followed the 2005 EPA *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities.* As described in detail in the report, the SRA approach included several components, in the following general sequence:

- Estimation of sediment contaminant concentrations
- Estimation of contaminant releases (emission rates)
- Air dispersion and deposition modeling of contaminants
- Contaminant toxicity assessment and toxicity factor selection
- Selection of exposure pathways and exposure scenarios
- Estimation of environmental media concentrations and human exposures
- Quantified risk and hazard.

Information utilized in the study included:

- 53 chemicals of potential concern
- Site-specific CDF operating parameters and schedules
- Five years of meteorological data from three nearby meteorological towers, including hourly wind speed, wind direction, and temperature to account for seasonal and climatic changes

- Compliance limits on emissions that the facility will be required to meet (25 tons per year volatiles and 25 tons per year particulate matter), which were not in effect at the time of the 1995 study.
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The following exposure scenarios were considered for cancer and noncancer health effects:

- Adult residents in six nearby neighborhoods
- Child residents in six nearby neighborhoods
- Students at local schools
- Local fishers (adults and children)
- Nursing infants.

Specifically, the SRA evaluated the following:

- Chronic inhalation exposures
- Acute inhalation exposures
- Chronic home-grown produce ingestion exposures
- Chronic incidental soil ingestion exposures
- Chronic fish consumption exposures
- Chronic dermal absorption exposures
- Early life stage differences.

Conclusions

The results of the SRA provide an estimate of cancer risks, noncancer hazard index results, early life-stage differences in exposure and toxicity, lead exposure, dioxin exposures and acute inhalation risks.

The risk of developing cancer is expressed as the chance or probability that an individual will develop cancer sometime during their lifetime from exposure to pollutants from the CDF. Using high-end exposure scenarios, the risk of developing cancer for an individual adult or child resident living near the CDF is estimated not to exceed 1.4 people in 100,000 people (expressed mathematically as 1.4×10^{-5}). The high-end cancer health risk found in the SRA is considered relatively low and below EPA's established risk level (less than 1.0×10^{-4}).

For non-cancer health effects, the study's results show that no individual chemical displays a "hazard quotient" above a level of 1.0. A hazard quotient indicates the extent to which an estimated level of chemical exposure is expected to cause adverse health effects. The hazard quotient is a ratio obtained by comparing the estimated chemical exposure level to a safe or "no effect" exposure level that should not cause serious illness even over the long term. A hazard quotient is determined for each chemical through each exposure pathway. The hazard quotients for all chemicals are then added, and the combined hazard quotients are called the "hazard index" for that exposure pathway.

For an estimated hazard index of less than 1.0, EPA will generally recommend no further action; for an estimated hazard index greater than 1.0, EPA will generally recommend some sort of action to cut down on the possible exposure to pollutants and reduce health risk. The total

hazard index for all the CDF chemicals combined is below 1.0 (highest HI Scenario, Adult Fisher HI = 0.265).

EPA evaluated possible lead exposure from the CDF. Lead can act as a developmental neurotoxin; therefore, lead exposure in young children is a significant health concern. Potential exposure to lead releases from the CDF could occur as the result of wind-blown particles landing on soil in the vicinity of the site. Exposure to lead emissions cannot be evaluated the same way that cancer and non-cancer risks are estimated. Instead, EPA uses a computer model that estimates possible increases in blood lead levels for children living near a lead source. The model showed that potential lead releases from the CDF will not cause significant increases in child blood lead levels.

EPA evaluated dioxin exposure from the CDF. For local adult and child residents, dioxin exposure is assumed to occur from consumption of locally caught fish, consumption of garden vegetables, incidental soil ingestion and dermal absorption. For infants up to 1 year of age, dioxin exposure is assumed to occur through breast milk consumption. The dioxin exposure estimates from the CDF were compared with expected U.S. average background exposure levels for adults and breast-feeding infants. The dioxin exposures estimated to occur from CDF emissions are much lower than the national background averages. Therefore, the estimated dioxin emission released from the CDF is not expected to significantly increase health risks compared to the existing background situation. In addition, potential cancer risk from dioxin exposure was also evaluated for adult and child residents.

EPA conducted a limited evaluation of potential early lifestage exposure and effects. This study attempts to quantify how much more sensitive exposed children are to pollutants than exposed adults. The study presents one exposure pathway (soil ingestion) to give a quantitative illustration showing the extent to which estimated cancer risk could increase under assumptions of increased childhood susceptibility to a particular type of carcinogenic agent. The study used age-dependent adjustment factors for sediment contaminants that have a mutagenic mode of carcinogenicity action. The early lifestage exposure study results show estimated cancer risk for exposure to these chemicals during ages zero to six years through the soil ingestion pathway produces approximately a three-fold increased cancer risk (from 1.6×10^{-6} to 5.2×10^{-6}) .

Finally, the SRA examined acute inhalation exposure from CDF contaminants. When compared with levels of pollutants that can cause illness, the study shows the health risks from breathing short-term concentrations of contaminated dust and vapor from the CDF are relatively low.

The Indiana Department of Environmental Management has set limits on the amount of air pollution that can be released from the site. The Army Corps of Engineers will conduct modeling in order to show that CDF emissions conform to these limits. The Corps will also operate monitors around the site to measure contaminants coming from the CDF. If the site does not exceed these air pollution limits, the health risks should not increase.

1 INTRODUCTION

1.1 Background

The United States Army Corps of Engineers (USACE) is authorized to operate and maintain a navigation project at Indiana Harbor in East Chicago, Lake County, Indiana, to allow for passage of ship traffic in the harbor and shipping canal. Northwest Indiana is part of a highly industrialized urban area, which is one of the nation's foremost locations for integrated steel production and a wide range of other manufacturing and petroleum refining activities. Sediments, many of which are contaminated from previous industrial discharges, have entered the Grand Calumet River/Indiana Harbor and Shipping Canal (GCR/IHSC) waterway and have been deposited in the channel, reducing depth and restricting the movements of navigational traffic. In order to maintain authorized channel depths, these sediments must be dredged periodically. Because these sediments are contaminated with a variety of pollutants, they must be disposed of properly. Local residents and others in the area have expressed concern about air pollutant emissions and potential health consequences from the USACE-operated disposal site that is under construction.

Indiana Harbor – View from Lake Michigan

In September 1998, USACE submitted a Comprehensive Management Plan for the proposed construction of a confined disposal facility (CDF) in East Chicago, Indiana for disposal of dredged sediments from the IHSC. This included a Feasibility Study (FS) and Environmental Impact Statement (EIS). Due to the concern of risks posed by construction and operation of a CDF, the United States Environmental Protection Agency (USEPA) conducted a risk assessment for USACE that was finalized in 1995 and included in the EIS. This report, titled *Inhalation Risk Analysis for Potential Air Emissions from the Proposed Confined Disposal Facility in the Recommended Alternative for the Indiana Harbor and Canal Sediment Dredging and Disposal Project* (USEPA 1995b), was finalized on September 1, 1995.

The study had three objectives:

1) To compare the proposed CDF particulate and volatile toxic air contaminant emissions to emissions reported in the Toxics Release Inventory (TRI) and reported in two previous air pollution studies in Northwest Indiana.

2) To compare the expected particulate and volatile air contaminant emissions from the CDF to those expected from the site in the absence of the CDF.

3) To assess the human health risks posed by the inhalation of potential airborne contaminants released from the proposed CDF.

The following is a summary of results from the 1995 study.

1) In comparison to air contaminant emissions reported in the TRI and in two previous air pollution studies conducted by USEPA Region 5 for the area, the projected emissions from the CDF are small—less than one percent of those reported in the inventory and from both of the air pollution studies.

2) Exposing dredged material to air following disposal in the CDF results in emissions of air toxics to the atmosphere that are greater than those that would occur with no activity at the site. However, some volatile and particulate emissions from the soil at the site will be eliminated by the construction of the CDF, because the CDF will cover a portion of the site and prevent emission of existing soil contaminants. It was not possible to determine if the CDF air emissions are significantly different from those posed by the existing site.

3) The cancer risk assessment reported that, using conservative input parameters, the total cancer risk due to inhalation of emissions from the CDF are smaller than the risks attributable to inhalation of existing air pollutants. The cancer risk due to inhalation exposure to CDF emissions is estimated to be 2.3×10^{-6} (2.3 in 1,000,000). Based on air monitoring data, the total estimated cancer risk due to air toxics inhalation exposure from other sources in the area (i.e., without including CDF emissions) for 30 years is estimated to be 3.1×10^{-4} (3.1 in 10,000 or 310 in 1,000,000). The noncancer assessment showed that adverse health effects from lifetime exposure to noncancer compounds emitted from the proposed CDF are unlikely.

1.2 Purpose

USEPA completed the risk assessment (described above) for the proposed CDF for dredged sediments from the IHSC in March 1994 and revised it in 1995. Most assumptions used in the 1995 risk assessment were attempts to err on the side of overestimating, rather than underestimating, pollutant concentrations and resulting risk from the CDF. However, to respond to public concerns, USEPA agreed in 2001 to perform additional risk assessment work to supplement the existing study. This Supplemental Risk Assessment (SRA) is intended to:

1) Provide additional information regarding potential exposures from the CDF
2) Be used as a predictive tool to help evaluate potential risks from proposed future CDF operations
3) Serve as a basis for recommending additional CDF emission controls and mitigation measures, if necessary.

Partly due to these limited objectives and scope (see below), SRA results are likely to be most informative when used in conjunction with other important information, such as CDF air monitoring data, future USACE sediment sampling and analysis; and controls and contingency plans to mitigate CDF emissions

1.3 Scope

The SRA will estimate incremental human health risks from CDF air contaminant exposure under certain emission, transport and exposure assumptions. There are uncertainties associated with those assumptions, as discussed in the report. The SRA will not evaluate "background" air pollution, nor is it designed to provide a prediction of cumulative human health risk associated with CDF air emissions and background air contamination from other local sources.

In keeping with the purpose and intent described in Section 1.2 above, the SRA will address the following:

- Inhalation, ingestion and dermal exposures. In addition to inhalation, the SRA addresses the concern that airborne particles could be deposited on the ground and absorbed through the skin or ingested from consuming locally grown produce.

- Potential exposures and potential health effects to children. The SRA addresses the concern that children are more sensitive to chemical exposures than adults.

- Additional contaminants. USEPA agreed to re-evaluate the list of chemicals of concern to assess whether additional chemicals of concern should be included.

- Potential exposures from dredging and transport of sediments. There was concern that contaminants could be released from the dredging and transport operations, as well as, the operation of the CDF. However, USACE has modified its dredging and transportation operations since the time that these concerns were raised. It was originally proposed that sediments be dredged, loaded into vehicles, and transported over road surfaces to the CDF. It is currently proposed that the dredged sediments be slurried and hydraulically placed directly into the CDF from a barge on the canal adjacent to the facility. This eliminates the concern of emissions from vehicular transportation. In addition, the surface area of the canal affected by dredging is very small relative to the surface area of the CDF, and therefore, relatively insignificant in terms of emissions.

- Use of more site-specific information. The SRA uses site-specific operational, meteorological and geographic information, to the extent that it is available.

Peer Review

In accordance with the USEPA Peer Review Handbook (USEPA 2005g), this SRA report and supporting documents have been subjected to an internal peer review by individual independent experts from within the Agency. Appendix 1-1 identifies the peer review panel members and provides copies of their credentials, Appendix 1-2 provides the charge to the peer review panel, and Appendix 1-3 provides the response to peer review comments report.