RECORD OF DECISION
FOR THE SEDIMENT OPERABLE UNIT
ST. LOUIS RIVER/INTERLAKE/DULUTH TAR SITE
DULUTH, MINNESOTA
UNDER THE MINNESOTA ENVIRONMENTAL RESPONSE AND LIABILITY ACT, Minn. Stat. §§ 115B.01-115B.24

Prepared by:

The Minnesota Pollution Control Agency

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ACRONYMS/GLOSSARY

Agreement	February 22, 2000 Agreement between the Minnesota Pollution Control Agency, The Interlake Corporation, Honeywell International Inc. and Domtar Inc. Concerning Selection of the Remedy for the Sediments Operable Unit of the St. Louis River/Interlake/Duluth Tar Superfund Site, as amended by Amendments No. 1 and No. 2.
Amendment No. 1	Amendment to the 2000 Agreement between the MPCA and the Companies; effective December 30, 2003
Amendment No. 2	Amendment to the 2000 Agreement between the MPCA and the Companies; effective April 24, 2003
Allied	AlliedSignal, Inc.
ARARs	Applicable and Relevant and Appropriate Requirements
B(a)P	Benzo(a)pyrene
BSIC	Bioaccumulative Substances of Immediate Concern
BCC	Bioaccumulative Chemicals of Concern
BAZ	Bioactive Zone
Beazer	Beazer East, Inc.
BT/PT	Best Technology in Process and Treatment
CAD	Confined Aquatic Disposal Facility
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cPAH	carcinogenic PAHs
Companies	Interlake (now XIK), Honeywell and Domtar
COCs	Contaminants of Concern
COE	U.S. Army Corp of Engineers
CSM	Conceptual Site Model
CWG	Community Work Group
Domtar	Domtar, Inc.
DGR	Data Gap Report
DNR	Department of Natural Resources
EPA	U. S. Environmental Protection Agency
FAV	Final Acute Values
FS	December 30, 2003, Revised Draft Feasibility Study and the FS Addendum No. 1
FS Addendum	March 29, 2004, Feasibility Study Revised Addendum No. 1
GAC	Granular Activated Carbon
Hallett	Hallett Dock Company
HAP	Hazardous Air Pollutant
HHSE	Human Health Screening Evaluation
Honeywell	Honeywell Inc. formerly AlliedSignal Inc.
HRV	Health Risk Value
HBV	Health Based Values
Interlake	The Interlake Corporation
IZ	Isolation Zone
LOAEL	Lowest Observed Adverse Effect Level
MERLA	Minnesota Environmental Response and Liability Act
MDH	Minnesota Department of Health
mg/day	milligrams per day
mg/Kg	milligrams per kilogram or parts per million)
mPECQ	Probable Effects Concentration Quotient
MPCA	Minnesota Pollution Control Agency
MPI	Malcolm Pirnie, Inc.
MSL	Mean Sea Level
NCP	National Contingency Plan
NOAEL	No Observed Adverse Effect Level
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRT	Natural Resource Trustees

O&M	Operation and Maintenance
OIRW	Outstanding International Resource Waters
OSHA	Occupational Safety and Health Agency
OU	Operable Unit
PEC	Probable Effects Concentration
PEL	Permisible Exposure Limit
PAHs	Polynuclear Aromatic Hydrocarbons
Parties	MPCA and the Companies
PCBs	Polychlorinated biphenyls
PEC	Probable Effects Concentration
PLP	Minnesota Permanent List of Priorities
ppm	parts per million (or mg/Kg or mg/L)
PRT	Peer Review Team
PRG	Preliminary Remediation Goal
RAOs	Response Action Objectives
RD/RA	Remedial Design/Response Action
RFRAs	Requests for Response Action for the SedOU issued by MPCA to Beazer, Domtar, Interlake and Allied under MERLA on March 22, 1994 and March 26, 1996RI Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RP	Responsible Party
ROD	Record of Decision
SDS	State Disposal System
SedOU	Sediment Operable Unit
Service	Service Engineering Group
SLRIDT	St. Louis River/Interlake/Duluth Tar
SMOA	Superfund Memorandum of Agreement
SOU	Soil Operable Unit
SQT	Sediment Quality Target
TAG	Technical Advisory Group
TEC	Threshold Effects Concentration
TCLP	Toxicity Characteristic Leaching Procedure
TSOU	Tar Seeps Operable Unit
TPAH	total PAHs
PEL-TWA	Time Weighted Average Permissible Exposure Limit
µg/L	micrograms per liter (or parts per billion)
$\mu g/m^3$	micrograms per cubic meter
VOCs	Volatile Organic Compounds
WCA	Wetland Conservation Act
WDNR	Wisconsin Department of Natural Resources
WLSSD	Western Lake Sanitary Sewer District
XIK	XIK Corporation, formerly Interlake
1E-5	One in 100,000 or 1×10^{-5}

EXECUTIVE SUMMARY

This Record of Decision (ROD) documents the selection of remedy by the Minnesota Pollution Control Agency (MPCA) for the Sediment Operable Unit (SedOU) of the St. Louis River/Interlake/Duluth Tar Superfund (SLRIDT) Site in Duluth, Minnesota, under the Minnesota Environmental Response and Liability Act (MERLA), Minn. Stat. §§ 115B.01-115B.24.

In 2000, MPCA reopened the Remedial Investigation and Feasibility Study (RI/FS) process for the SedOU under an Agreement between the MPCA and three Responsible Parties (RPs) for the SLRIDT site (the Companies). After completion of the reopened RI/FS process, the MPCA issued a Proposed Plan to the public on April 27, 2004 that identified the Revised Dredge/Cap Hybrid Alternative as MPCA's preferred cleanup alternative for the contaminated sediment. On May 10, 2004, the MPCA presented its Proposed Plan in a public meeting in Duluth. The MPCA accepted written public comments on the Proposed Plan through May 26, 2004. The MPCA reviewed all the comments received during the public comment period. A summary of comments received and MPCA's response to those comments is documented in this ROD.

This ROD presents information about SLRIDT site background and characterization including areas of contaminated sediment and summary of human health and ecological risks; identifies Applicable and Relevant and Appropriate Requirements (ARARs), Response Action Objectives (RAOs) and Cleanup Levels, and other requirements that must be met in implementing the remedy; and evaluates and compares the remedy alternatives based on the remedy selection criteria set by MPCA. Legal determinations supporting selection of the remedy are also included in this ROD.

Under the ROD, Alternative 3, the Revised Dredge/Cap Hybrid, is the remedy selected by the MPCA.

1.0 INTRODUCTION

1.1 Purpose; Legal Authorities.

This ROD documents the selection of remedy by the MPCA for the SedOU SLRIDT site in Duluth, Minnesota.

This remedy is selected in accordance with the MERLA, Minn. Stat. §§ 115B.01-115B.24. Remedy selection follows the process set forth in the Requests for Response Actions (RFRAs) issued to the RPs by the MPCA on March 22, 1994 and March 26, 1996, and the Agreement between the MPCA, The Interlake Corporation, Honeywell International Inc. and Domtar Inc. Concerning Selection of the Remedy for the Sediments Operable Unit of the St. Louis River/Interlake/Duluth Tar Superfund Site, as amended (Agreement).

Pursuant to an agreement between the MPCA and the United States Environmental Protection Agency (EPA), the MPCA is the lead agency for enforcement of Superfund cleanup requirements for the SLRIDT site. In MPCA's judgment, the decision to select this remedy is not inconsistent with the requirements the Federal Superfund law (Comprehensive Environmental Response, Compensation and Liability Act or CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) adopted under CERCLA, and the remedy complies with the terms and conditions of the Deferral Pilot Agreement entered into by MPCA and EPA in 1995.

1.2 Organization of the ROD

Section 1 of the ROD presents the purpose of the ROD, the legal authorities under which it is issued, and a discussion on the SLRIDT site background information including location, operational and regulatory history, discovery of hazardous substance releases, discussion of the remedy Operable Units (OU), and community participation. Section 2 presents a technical characterization of the SLRIDT site, including hydrogeologic setting, areas of contaminated sediment, a summary of human health and ecological risks, and a conceptual site model (CSM) based on contaminant fate and transport, exposure pathways and potential receptors. Section 3 presents the ARARs, RAOs, Cleanup Levels, and other requirements or considerations that must be addressed in implementing the SedOU remedy at the SLRIDT site. Section 4 describes the remedy alternatives considered in the reopened RI/FS process including the public process that led to a modification of the alternatives discussed in the Revised Draft Feasibility Study (FS). Section 4 also describes remedial technologies and components, and how they were combined to form the evaluated alternatives, and treatability studies conducted in the RI/FS process. Section 5 presents the criteria used to evaluate the remedy alternatives under the RFRAs and summarizes the MPCA's evaluation of each alternative against those criteria. Section 6 compares the strengths and weaknesses of the evaluated alternatives under the remedy selection criteria. Section 7 presents EPA's 11 "Principles for Managing Hazardous Waste Sites" (EPA 2000) along with a brief description of how each principle was applied during the RI/FS process. Section 8 presents the MPCA's selected remedy alternative. Section 9 presents the MPCA's legal determinations which support the selection of the remedy. References cited in this ROD are presented in Section 10.

1.3 SLRIDT Site Background Information

This section includes a summary of information about the location of the SLRIDT site and the history of industrial activities at the SLRIDT site, as well as the environmental regulatory and procedural history leading up to this ROD.

1.3.1 SLRIDT Site Location

The SLRIDT site is located within the West Duluth neighborhood of the City of Duluth, on the north bank of the St. Louis River, approximately four river miles upstream from Lake Superior (Figure 1.3.1-1).

The SLRIDT site includes approximately 255 acres of land and river embayments, wetlands, and shipping slips. The land portion of the SLRIDT site includes the 59th Avenue (Hallett) Peninsula and the 54th Avenue Peninsula, and is bounded on the north by the Burlington Northern right-of-way. Specific areas within the SLRIDT site and site features are depicted on Figure 1.3.1-2, using letters to designate Areas.

The aquatic portion of the SLRIDT site includes Stryker Bay (approximately 41 acres and defining the western boundary of the SLRIDT site), Slip 6 (about 15 acres), and Keene Creek Bay/Slip7 (including the 48-inch outfall area and the Minnesota Channel - about 34 acres and defining the eastern boundary), and a portion of the St. Louis River to the south of the two peninsulas and slips. A small portion of the SedOU (approximately 0.3 acres at the mouth of Slip 6 and 1.1 acres in the Minnesota Channel – aka the Federal Navigation Channel) is within the waters of the State of Wisconsin.

Residents are located west of the SLRIDT site on the 63rd Avenue Peninsula (on the west side of Stryker Bay), and to the north of the railroad tracks that form the northern boundary of the SLRIDT site. According to the 2000 census, approximately 960 people live within one half of a mile of the SLRIDT site.

1.3.2 SLRIDT Site Industrial History

The SLRIDT site has been used for industrial purposes since at least the 1890s. Prior to industrialization the SLRIDT site was predominantly open water and was part of St. Louis Bay, bounded on the west by 63rd Avenue Peninsula.

In 1904, Zenith Furnace Company began producing coke and byproducts near the north end of what is now the 59th Avenue Peninsula (Area D). A water (town) gas manufacturing plant operated intermittently in Area D from 1905 to 1961. Duluth Tar Company began refining tar in 1905 in Area A. Crude coal tar was sold by Zenith Furnace Company to Duluth Tar Company. In 1916, Duluth Tar Company became Barrett Tar Company, which closed in about 1924. A new tar refining operation was built in 1924 in Area E, adjacent to the Duluth Tar Company/Barrett Tar Company facility. The new facility, owned by Dominion Tar Company and American Tar Company, operated until 1948. These facilities purchased coal tar from Zenith (later Interlake), operated batch coal tar stills and manufactured tar products. The tar and chemical companies closed down by 1948, and the most recent iron plant has not operated since about 1960. In addition, Figures 1.3.2-1a, 1b, and 1c provide a perspective of historical activities

in 1910, approximately 1939, and 1947. Figure 1.3.2-2 shows the historical development of 59th and 54th Avenue Peninsulas.

In 1929, Zenith Furnace Company's coking operations were relocated to Area B (the head of the current Hallett Slip 6) and the company became the Interlake Iron Company. Its water gas plant remained in Area D. Crude tar produced from coking operations at the Interlake Iron facility was sold to the tar refineries located in Area E. Other industrial byproducts were used in conjunction with re-deposited native sediment as fill to create new land, including the 59th Avenue Peninsula and the 54th Avenue Peninsula. The primary fill material is slag from on-Site pig iron operations.

Interlake Iron's operations ceased in 1961, and the property was idle until 1966, when Hallett Dock Company (Hallett) purchased the former Interlake Iron portion of the SLRIDT site. Hallett has used the property primarily for bulk storage and handling of coal, coke, bentonite, and other industrial materials, including calcium chloride. Hallett has sold and leased northern portions of the SLRIDT site to other companies.

Area A is currently owned by Northern Real Estate & Investments, LLC and is vacant. Area E was occupied by Duluth Wrecking Company (an automobile salvage company) from 1963 until the late 1990s, when the property was sold to the current owner, EBI (formerly Earthburners, Inc.), a construction and remediation company.

The sources of contamination in the sediments at the SLRIDT site were primarily wastewater discharges that began in the early 1900s from the water gas, coking and tar facilities formerly located on the SLRIDT site. The last industrial discharges from these facilities were terminated no later than 1961 when Interlake Iron shut down the last operating facility. Waste discharge areas include the Area F crescent shaped pond and Area A and E discharge pipes that drained into Stryker Bay. Area C pond and the 48 inch outfall pipe discharged into Keene Creek Bay and the southern tip of the 54th Avenue Peninsula (see Figure 1.3.1-2).

1.3.3 Discovery of Hazardous Substance Releases and Enforcement Activities

In 1979, analysis of sediment samples, collected by the MPCA staff, detected Polynuclear Aromatic Hydrocarbons (PAHs) in Stryker Bay sediments. PAHs are a group of carcinogenic and noncarcinogenic compounds formed during the combustion of coal, oil, gas, wood and other substances. At the SLRIDT site, PAHs are a by-product of the production of water (town) gas, high-temperature coking of coal and the distillation of crude tar. PAHs are hazardous substances under the State and Federal Superfund laws.

In 1980, MPCA staff's analysis of samples of Stryker Bay surface water showed the presence of PAH compounds. In addition, in 1981 a local resident reported oil rising to the surface of Stryker Bay, from the slow release of coal tar oily waste mixed in with sediments.

In 1983, the EPA evaluated the SLRIDT site and the St. Louis River/U.S. Steel site (located on the St. Louis River approximately 4 river miles upriver from the SLRIDT site) and added them as a single site to the National Priorities List (NPL, the Federal Superfund list). The federally listed site is referred to as the St. Louis River/Interlake/U.S. Steel site. Although the two sites

are listed as one on the NPL, they are listed separately on the Minnesota Permanent List of Priorities (PLP, the State superfund list) and are being investigated and cleaned up separately.

As part of the initial SLRIDT site investigations, the MPCA staff identified four RPs, three of which have taken and/or agreed to take remedial actions for various portions of the SLRIDT site. The three RPs that have agreed to take remedial actions for the SedOU are: the XIK Corporation (formerly the Interlake Corporation or Interlake), Honeywell Inc. (formerly AlliedSignal Inc. or Allied), and Domtar Inc. (Domtar), also collectively referred to as the Companies. The fourth RP, Beazer East, Inc. (Beazer), has not participated. The releases and threatened releases of hazardous substances identified at the SLRIDT site were grouped into three units for purposes of taking investigation and response actions. The three units, referred to as Operable Units or OUs, are the Tar Seeps OU (TSOU), the Soils OU (SOU), and the Sediments OU (SedOU).

Pursuant to the MERLA, the MPCA issued RFRAs for the SLRIDT site to the Responsible Parties as summarized below:

- The MPCA issued RFRAs in March 1991 and May 1993 (MPCA 1991 and MPCA 1993, respectively) to the RP to investigate and/or clean up the TSOU and SOU.

- The MPCA issued two RFRAs for the SedOU: one in March 1994 to Interlake, and a second one in March 1996 to Beazer, Allied, and Domtar. Interlake was named responsible under MERLA for sediment contamination in all areas while Allied, Domtar and Beazer were named for Stryker Bay (including Area F).

Preliminary investigations of the TSOU, SOU, and SedOU were conducted by Malcolm Pirnie, Inc. (MPI) for the MPCA and the results were reported in the January 1990, RI Report (MPI 1990). The Companies completed RI/FS reports on the SOU from 1991 through 1995. The TSOU remediation was completed in 1994, and the SOU remediation was completed in 1997. A summary regarding the TSOU can be found in the February 22, 1994, TSOU Final Report and a summary regarding the SOU can be found in the October 27, 1997, Completion Report. Additional discussion of the remedies for the TSOU and SOU is found in Section 1.3.4. Limited sediments investigation was performed by the MPCA and EPA staff using the EPA "Mud Puppy", an EPA boat used for sediment sampling, in September 1993.

On December 2, 1994, the MPCA and EPA Region 5 entered into a Superfund Memorandum of Agreement (SMOA). The SMOA delineates the respective roles and responsibilities of MPCA and EPA as they relate to the conduct of the Superfund program in Minnesota. The SMOA assures that response action alternatives are conducted at NPL sites in accordance with CERCLA, the NCP, MERLA and other applicable State and Federal laws and regulations. The SMOA designated the St. Louis River/Interlake/U.S. Steel site as a state-lead enforcement site, with MPCA the lead agency working with the RP to investigate and remediate the Site.

On June 20, 1995, EPA and the MPCA entered into another agreement entitled "Minnesota Pollution Control Agency Enforcement Deferral Pilot Project" ("Enforcement Deferral Pilot Project"; MPCA 1995). Under the Enforcement Deferral Pilot Project, the MPCA assumed full responsibility at 13 State-enforcement lead NPL sites, including the St. Louis River/Interlake/U.S. Steel site. The responsibilities assumed by MPCA include: utilizing state

authorities to investigate and clean up the sites; conducting the necessary enforcement actions available to the State of Minnesota; and planning and reporting site progress information to EPA. As part of this agreement, EPA is deferring to the MPCA on SLRIDT site decisions and will not review technical documents or concur with any RODs issued under the Enforcement Deferral Pilot Project. The EPA's role with regard to the Enforcement Deferral Pilot Project sites is to assure that the selected remedies are protective of human health and the environment and that decisions made by the MPCA are not inconsistent with the NCP. In order to measure the success of the Enforcement Deferral Pilot Project provides that EPA will analyze state RODs to evaluate the quality of the remedies selected by the MPCA.

In November 1998 the MPCA presented a Proposed Plan to the public with the MPCA's preferred remedy for the SedOU. At that time, the Companies requested and were granted the opportunity to collect more information prior to MPCA's decision on the remedy. In October 1999 the MPCA staff proposed a remedy for the SedOU which was documented in a ROD that was proposed for adoption by the MPCA Citizen's Board. The Companies sought a contested case proceeding on the ROD, and sought to propose an additional remedy alternative for Board consideration. In December, 1999, the MPCA Board adopted a resolution which adopted the October 1999 ROD effective March 1, 2000, but providing that this decision would not become effective if the Board approved an agreement between the Companies and MPCA by its February meeting date which provided for the reopening of the RI/FS for the SedOU upon terms acceptable to the MPCA. On February 22, 2000, the MPCA approved an agreement with the Companies which provided a process for reopening the RI/FS and selecting a remedy for the SedOU. The Companies committed to implement the remedy selected under the Agreement.

Pursuant to the Agreement, the Parties also formed a Peer Review Team (PRT), which was charged to, among other things, review the reopened RI/FS and provide expert comment and advice to the MPCA and the Companies (collectively, the Parties). The PRT was composed of eight members, who represented the four areas of expertise identified by the Agreement, and was administered by a Coordinator. The Agreement originally identified four remedy alternatives to be evaluated:

- No Action;
- Wetland Cap: Capping contaminated areas of the SLRIDT site;
- Dredging & On-Site Disposal: Dredging contaminated areas to a disposal cell in Slip 6; and
- Dredging & Off-Site Disposal: Dredging contaminated areas, dewatering the sediment on-Site and transporting the dewatered sediment off-Site to a licensed disposal facility.

The Agreement allowed for modifications of these alternatives where justified by new information or new ideas. The Agreement also allowed for the PRT to review the new data collected and advise on the data gaps and on the strengths and weaknesses of the alternatives. Additional data collected to fill the data gaps was submitted to the MPCA in the November 27, 2002 Data Gap Report (DGR; Service 2002). Meetings were held during the data gathering period in 2001 and 2002 to discuss the data and associated issues with the PRT. The MPCA facilitated a two-day meeting with the Companies and key stakeholders in February 2003 to discuss the remedy implications of this new information. The meeting included representatives of the Companies and their consultants; MPCA staff; the PRT; State, Federal and tribal natural resource managers; SLRIDT site property owners; area residents; the City of Duluth; and other stakeholders.

The participants in the February 2003 meeting identified a number of new hybrid remedy alternatives and key unresolved issues affecting remedy selection and implementation. Using the information developed at the February 2003 meeting the Companies, the MPCA, and the Department of Natural Resources (DNR) identified a hybrid remedy alternative involving dredging, capping and containment, that could be evaluated in the FS. The participants in the February 2003 meeting reconvened in August 2003 to discuss the new hybrid remedy option, the Dredge/Cap Hybrid Alternative. As a result, the Companies and the MPCA amended the 2000 Agreement (Amendment No. 1, effective on December 30, 2003) to substitute the Dredge/Cap Hybrid Alternative for the Dredging & On-Site Disposal Alternative in the FS. The Revised Draft Feasibility Study was submitted on December 30, 2003. The MPCA completed their review and approved the Feasibility Study with modifications on January 14, 2004. However, additional studies subsequent to the Companies' submittal of the December 30, 2003 Revised Draft FS revealed that the capacity for storing dredged material in a Confined Aquatic Disposal Facility (CAD) in Slip 7 was overestimated, and the volume of material to be dredged was underestimated. Therefore, the Dredge/Cap Hybrid Alternative was revised to move the containment of dredged materials from Slip 7 to Slip 6 and the Companies submitted Addendum No. 1 to the Feasibility Study on March 29, 2004 (FS Addendum). The Agreement was again amended to reflect this revision in the hybrid alternative (Amendment No. 2, effective on April 24, 2004). The MPCA completed their review and approved the FS Addendum with modifications on April 27, 2004.

On April 27, 2004, the MPCA issued a Proposed Plan to the public for review and comment that identified the Revised Dredge/Cap Hybrid Alternative as MPCA's preferred cleanup alternative for the contaminated sediment. On May 10, 2004, the MPCA presented its Proposed Plan in a public meeting in Duluth. The MPCA accepted written public comments on the Proposed Plan through May 26, 2004. The MPCA reviewed all the comments received during the public comment period and provided a summary of significant comments along with the MPCA staff's response in Appendix 1 to this ROD MPCA's selected remedy for the SedOU is documented in this ROD.

1.3.4 Scope and Role of Operable Units

Cleanup of a Superfund site can be divided in OUs depending on the complexity of the releases to be addressed at a site. An OU is a discrete set of response actions intended to address particular geographic areas of a site, particular kinds of releases, or other phases of an overall cleanup. There are three OUs at the SLRIDT site. This ROD addresses the Sediments Operable Unit or SedOU. Each operable unit at the SLRIDT site is described below.

Tar Seeps Operable Unit: The tar seeps can be defined as amorphous, black residues from the coking process and other industrial activities characterized by high concentrations of PAHs. The selected remedy for the TSOU was completed in March 1994, and included excavation of the tar seep wastes and transportation of the wastes to be burned off-site for energy recovery at the Missouri Fuel Recycler/Continental Cement Company of Hannibal, Missouri. However, 14 roll-off boxes of nonfuel-grade material were stored at the SLRIDT site and subsequently addressed along with the remediation of the SOU. In addition, the tar associated with the TSOU in Areas A and E was not of a quality to allow its use as a recyclable/burnable fuel. Therefore, remediation

of tar in Areas A and E was deferred for treatment in the SOU. The TSOU remediation was completed in March 1994.

Soil Operable Unit: Area A & E soils were impacted by tar distillation operations conducted by Domtar, Allied and Beazer. Area B, Area C (including the Outfall Ponds and Ditches Area), Area D, Area F (including the Area F Pond, the Area F Boat Slip Dredge Spoils and the Area F Fill) and the Maurice's Parking Lot contain soil contaminated by Interlake industrial operations. The contamination in these areas was primarily PAH compounds, although volatile organic compounds (VOCs) were also present in some areas. The SOU remediation was completed in October 1997 using a combination of on-site incineration and landfilling. Because the current and future use of the upland portion of the SLRIDT site is industrial, remedial actions included cleaning up the contaminated soil to accommodate an industrial setting. As a result, property use restrictions were developed by the MPCA for recording by the landowner with the property records. Groundwater monitoring is also being addressed as part of the five year review of the SOU.

Sediment Operable Unit: The SedOU addresses contaminated sediment impacted by discharges from the industrial operations into the water at Stryker Bay (including the Area F Basal Tarry Layer), Slip 6, the 48-inch outfall area, Keene Creek Bay/Slip 7, and the basal tarry unit south of the 1885 shoreline, underlying 59th Avenue Peninsula (Area F) (see Figure 1.3.1-2). The FS Addendum estimated the in-situ contaminated sediment volumes within the aquatic portion of the SedOU to be approximately 501,000 to 609,000 cubic yards (Service 2004). This estimated volume is based on the contaminated sediments estimated to exceed the MPCA RAO and Cleanup Levels (see discussion in Section 3). Additional discussion on the areas of sediment contamination is presented in Section 2.2.

This ROD presents the selected remedial action for the SedOU. The contaminants present in this OU are hazardous substances under MERLA and CERCLA, which currently pose a risk to human health and the environment due to direct and/or indirect exposure to contaminated sediments. Also, there is a potential for discharge of contaminated ground water from the SLRIDT site to surface water. The ground water at the SLRIDT site is not a source of drinking water but does discharge to the St. Louis River. Ground-water contamination and groundwater to surface water discharge will also be addressed in this operable unit.

The purpose of this remedial action is to protect public health and the environment by minimizing exposure to the SLRIDT site contaminants through preventing exposure to contaminants above the RAOs and Cleanup Levels. The environmental requirements and standards for the sediment remediation selected in this ROD are discussed in Section 3.0.

1.3.5 Highlights of Community Participation

To obtain input on community concerns about the cleanup of the SLRIDT site, the MPCA staff established a Community Work Group (CWG) to discuss the issues involved with the investigation and cleanup of the SLRIDT site. The CWG has been meeting since March 1995, and consists of representatives of neighboring residents, local community associations, current SLRIDT site property owners, environmental groups, Responsible Parties, city officials, MPCA officials and other interested parties.

As stated previously, the MPCA facilitated a two-day meeting in February 2003 to discuss the remedy implications of new information gathered for the DGR. The meeting included representatives of the Companies and their consultants; MPCA staff; the PRT; State, Federal and tribal natural resource managers; SLRIDT site property owners; area residents; the City of Duluth; and other stakeholders. The participants identified a number of new hybrid dredge/cap alternatives and key unresolved issues affecting remedy selection and implementation. Using the information developed at the February 2003 meeting the Companies, the MPCA, and the DNR identified a hybrid remedy alternative involving capping, dredging and containment, which could be evaluated in the FS. The participants in the February 2003 meeting reconvened in August 2003 to discuss the new hybrid option.

The Proposed Plan for the SedOU at the SLRIDT site was made available to the public for comment on April 27, 2004. The notice of availability of the Proposed Plan and Public meeting was published in the Duluth News Tribune on May 5, 2004. A public comment period on the Proposed Plan was held from April 27, 2004, to May 26, 2004. In addition, a public meeting was held on May 10, 2004, at which the MPCA staff presented its Proposed Plan to the public at the Duluth Entertainment Convention Center. Approximately 140 people attended the public meeting. At this meeting the MPCA staff also presented an overview of the SLRIDT site history, and answered questions about the SLRIDT site and the remedial alternatives under consideration. The MPCA accepted verbal public comments at the meeting and written public comments on the Proposed Plan through May 26, 2004.

A summary of significant comments received by the MPCA during the public comment period is included as Appendix 1 to this ROD, along with the MPCA staff's response to those comments. The Proposed Plan and other SLRIDT site-related documents are available to the public at the MPCA, Duluth, Minnesota Regional Office and in the West Duluth Public Library.

2.0 SITE CHARACTERIZATION AND SUMMARY OF SITE RISKS

An appropriate step in investigating and implementing a remedy is to develop a Conceptual Site Model or CSM. The CSM is a three-dimensional representation of SLRIDT site conditions that conveys information on what is known or suspected about the sources of contamination, releases of hazardous substances into various media such as surface water, sediments and groundwater, release mechanisms, contaminant fate and transport, exposure pathways, potential receptors and risks, and is further refined to show the relationship of contamination to human health and ecological risks. This section discusses information about the hydrogeologic setting and areas of sediment contamination that was used in the construction of the CSM.

2.1 Hydrogeologic Setting

The regional groundwater flow system in the area generally flows from the Minnesota and Wisconsin uplands and discharges to Lake Superior and the St. Louis River estuary. The regional groundwater flow system at the SLRIDT site is limited to buried sand and gravel aquifers that are separated from the local groundwater flow system by up to 80 feet of confining silts and clays. The deep regional aquifer at the SLRIDT site is not contaminated and is under artesian conditions.

The local groundwater flow system at the SLRIDT site is a water table aquifer that is supplied by local recharge and generally flows south from the adjacent uplands and radially from the on-site peninsulas to the on-site embayments and slips. Along the northeastern edge of Stryker Bay where native sediments exist, a clay confining unit is present at an elevation above the St. Louis River water level resulting in local groundwater discharge through seeps along the banks in this area. In other areas of the SLRIDT site flow is through native silts and sands in the northern portion of the SLRIDT site and through industrial fill composed of slag, ash and other materials that were used to build the peninsulas. In these areas local groundwater flow discharges to surface water through the beds of the on-site embayments, slips and adjacent areas of the main river channel.

2.2 Contaminants of Concern

The following summarizes potential toxic effects associated with the Contaminants of Concern (COCs) at the SLRIDT Site.

PAH Compounds: PAHs are the primary COC for the SedOU at the SLRIDT site. PAHs are a group of over 100 different chemicals. Generally, PAHs are formed as a result of incomplete combustion of organic materials such as coal, oil, gas, wood, garbage, and tobacco and charbroiling meat. Natural sources of PAHs include volcanoes, forest fires, crude oil and shale oil. Although most PAHs have no known use, some are used in pharmaceuticals and to make dyes, plastics, resins, and pesticides. PAHs are also found in asphalt used in road construction, roofing tar, and creosote.

Human exposure to PAHs is expected to be highest among individuals who work with products containing PAHs (e.g., foundry workers, roofers), smokers and nonsmokers who live or work with smokers, members of the general public who heat their homes with wood-burning stoves,

and individuals who live within the vicinity of emission sources containing PAHs. People who consume grilled or smoked food and recreational or subsistence fishers who may consume appreciable amounts of fish caught locally from contaminated water bodies may be exposed to higher concentrations of PAHs. PAH contamination has triggered the issuance of human health advisories in several states. The EPA has recommended that PAHs be monitored in fish and shellfish as part of state monitoring programs and that this data be utilized to determine the need for issuing fish and shellfish consumption advisories.

Individual PAHs generally do not occur alone in the environment. They are found as part of complex mixtures of chemicals such as may be found in soot or crude oil. The health effects of PAHs vary with the individual compound and information adequate for quantifying adverse health effects exists for only a small number of PAH compounds. PAHs are usually broken down into two groups based on toxicity: carcinogenic PAHs (cPAHs) and noncarcinogenic PAHs.

cPAHs. The cPAHs include but are not limited to benz[a]anthracene, benzo[a]pyrene, benzo[b,j,k]fluoranthene, chrysene, dibenz[a,h]acridine, dibenz[a,j]acridine, dibenz[a,h]anthracene, 7H-dibenzo[c,g]carbazole, dibenzo[a,e]pyrene, dibenzo[a,h]pyrene, dibenzo[a,i]pyrene, dibenzo[a,l]pyrene, 7,12-dimethylbenz[a]anthracene, 3,7-dinitrofluoranthene, 3,9-dinitrofluoranthene, 1,6-dinitropyrene, 1,8-dinitropyrene, indeno[1,2,3-cd]pyrene, 3-methylcholanthrene, 5-methylchrysene, 5-nitroacenaphthene, 6-nitrochrysene, 2-nitrofluorene, 1-nitropyrene, and 4-nitropyrene. The cPAHs are generally attached to dust particles or as solids in soil or sediments. Humans exposed occupationally through inhalation or skin contact with mixtures containing PAHs for long periods have developed lung and skin cancer. Animals exposed by inhalation, ingestion or dermal contact with PAHs have also developed tumors. Increased incidences of tumors in fish are often associated with PAH-contaminated sediments.

Noncarcinogenic PAHs. The noncarcinogenic PAHs include, but are not limited to, phenanthrene, pyrene, acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, fluoranthene, fluorene, naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene. The movement of PAHs in the environment depends on their chemical properties such as water solubility and vapor pressure. Several noncarcinogenic PAHs dissolve more readily in water and evaporate more readily into air (e.g., anthracene, naphthalene). Although individual noncarcinogenic PAHs do not exhibit the same health effect, the most commonly impacted organs are the liver, kidney, and the blood system. Some noncarcinogenic PAHs also exhibit phototoxicity, i.e., they become more toxic in the presence of sunlight.

PAHs that were analyzed for and/or found at the SLRIDT site are presented in the Tables in Appendix 4.

Metals.

Metals are also present in SRIDT site sediments, soil, and ground water and are COCs for the SedOU.

Arsenic. Inorganic arsenic has been recognized as a human poison since ancient times, and large oral doses can produce death. Exposure to elevated levels of arsenic can result in damage to many tissues including the nervous system, cardiovascular system, gastrointestinal system and skin. Arsenic is a known carcinogen. Inhalation of inorganic arsenic increases the risk of lung cancer and ingesting of inorganic arsenic increases the risk of skin cancer and tumors of the lung, liver, kidney and bladder. EPA set a limit of 10 micrograms per liter (μg/L) for arsenic in drinking water.

Arsenic is bioconcentrated by organisms however, it is not biomagnified in the food chain. Some species of aquatic organisms, plants, birds and mammals can be adversely affected by relatively low concentrations of arsenic in the environment.

Cadmium. Cadmium is not an essential nutrient and has no known beneficial effect in humans or animals. Long term exposure to cadmium in air, food, or water leads to a build up of cadmium in the kidneys and possible kidney disease. Other potential long-term effects are lung damage and fragile bones. Based on limited evidence of increased lung cancer in humans from inhalation of cadmium and strong evidence of tumor formation in animal studies, cadmium and cadmium compounds are considered probable human carcinogens. At present, it is do not known if ingesting cadmium or skin contact with cadmium causes cancer.

Cadmium is bioconcentrated and bioaccumulated by organisms, and may biomagnify in lower trophic levels of food chains.

Chromium. Chromium has three main forms: chromium (0), chromium (III) and chromium (VI). Chromium (III) compounds are stable and occur naturally. Chromium (0) does not occur naturally and chromium (VI) occurs only rarely.

Most of the Chromium present at the SLRIDT site is believed to be Chromium (III). Chromium (III) is an essential nutrient in our diet, but only a small amount is needed. Our bodies do not need other forms of chromium. All forms of chromium can be toxic at high levels, but chromium (VI) is significantly more toxic than chromium (III).

Discharge of chromium wastes into streams and lakes has caused damage to aquatic ecosystems. No biomagnification of chromium has been observed in food chains.

Copper. Copper is essential for good health however, exposure to large amounts of copper can be harmful. Long term exposure to copper dust can irritate the respiratory system and eyes as well as affect the nervous system. Ingestion of elevated levels of copper can result in gastrointestinal upset. Very young children are sensitive to copper and long term exposure to high levels of copper may cause liver damage and death. Copper is not known to cause cancer.

Copper is among the most toxic of the heavy metals in aquatic biota, and often accumulates and causes irreversible harm to some species at concentrations just above levels required for growth and reproduction. Copper does not tend to biomagnify in the food chain.

Lead. Lead is neither essential nor beneficial to living organisms. Lead can affect many organs and systems in the body with the most sensitive being the nervous system, particularly in young and unborn children. Unborn children can be exposed to lead through their mothers. Lead also

damages kidneys and affects the immune system, blood and cardiovascular system, and reproductive system. The effects are the same whether it is breathed or swallowed. Lead is considered to be a probable human carcinogen based on studies in animals. There is inadequate evidence to clearly demonstrate carcinogenicity in humans.

Lead is also toxic to aquatic organisms, plants and wildlife. However, food chain biomagnification of lead is negligible.

Mercury. Mercury is not an essential nutrient and has no known beneficial effects in organisms. Exposures to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. The nervous system in particular is very sensitive to all forms of mercury. Mercuric chloride and methyl mercury are considered to be possible human carcinogens based on limited studies in animals. Data regarding carcinogenicity in humans is not available.

Organic mercury compounds are more toxic than inorganic compounds. The most common organic mercury compound, methyl mercury, is produced mainly by small organisms in the water, sediment and soil. Once methyl mercury is formed it can bioaccumulate and biomagnify through the foodchain, causing adverse effects in upper trophic level species. Ingestion of contaminated fish can be a significant source of exposure for humans and wildlife. Many waters in Minnesota, including the St. Louis River estuary where the SLRIDT site is located have fish consumption advisories due to mercury contamination of fish.

Nickel. The most common adverse health effect of nickel in humans is an allergic reaction. People can become sensitive to nickel when jewelry or other items containing nickel are in direct contact with skin. Once a person is sensitized to nickel, further contact will typically produce a rash at the site of contact. Less frequently, some people who are sensitized have asthma attacks following exposure to nickel.

Nickel and certain nickel compounds are considered to be carcinogenic based on increased lung and nasal cancers in workers exposed to high levels of nickel while working in nickel refineries or nickel processing plants.

Animal studies have shown that eating or drinking large amounts of nickel compounds may result in adverse affects on the respiratory system, gastrointestinal system, blood system, liver, kidneys, immune system, reproductive system, and development.

Nickel is essential for the normal growth of many species of microorganisms and plants, and several species of vertebrates. However, nickel is toxic to sensitive aquatic organisms at quite low concentrations. Aquatic organisms can bioconcentrate and bioaccumulate nickel, but nickel does not biomagnify through food chains.

Zinc. Zinc is an essential element for all living organisms. Too little zinc in the diet can cause health problems, but too much zinc is also harmful. The recommended dietary allowance for zinc is 15 milligrams per day (mg/day) for men, 12 mg/day for women, 10 mg/day for children and 5 mg/day for infants. Harmful health effects generally begin at levels 10 – 15 times the recommended allowance. Ingesting too much zinc, even for a short time can cause stomach

cramps, nausea and vomiting. Taken over longer periods of time, it can cause anemia, pancreas damage, and changes in cholesterol levels. Zinc has not been classified for carcinogenicity.

Zinc is toxic to some aquatic organisms at relatively low concentrations. Zinc is of particular importance in aquatic environments because the gills of fish are physically damaged by elevated concentrations. Biomagnification of zinc through food chains is negligible.

Other Contaminants of Potential Concern. A variety of VOCs (e.g., benzene, ethylbenzene, toluene, xylene) are also present in SLRIDT site sediments, soil, and ground water as a result of past industrial activities. Sampling data for sediments, ground water, and surface water indicate that they are not detected above RAOs and Cleanup Levels.

2.3 Areas of Sediment Contamination; Conceptual Site Model

Information on the areas, volumes and concentrations of sediment contamination was developed and reported in the DGR (Service 2002), and the SedOU FS (Service 2003 and Service 2004). The Companies' CSM for the SedOU's four water bodies were obtained from their FS and are presented in the ROD as Figure 2.2-1 (Stryker Bay), Figure 2.2-2 (The Slips), and Figure 2.2-3 (The Main Channel) (Service 2003) and the primary features of each are described below.

2.3.1 Stryker Bay

Stryker Bay is a shallow, flat-bottomed bay of approximately 41 acres with an average water depth of approximately 3 to 5 feet. There are homes to the west and industrial land to the north and east. A wetland is located at the north end where an unnamed stream enters the Bay from a steep urban watershed and another wetland is located in the southwest corner near the mouth of the Bay.

Contaminated sediment underlies most of Stryker Bay (Figure 2.2-1) and has been divided into four distinct layers. The uppermost sediment layer (Layer 101) is an intermittent layer averaging six inches thick throughout the Bay, except in shallow wave-washed areas where it is absent and Layer 102 is exposed. These wave washed areas are on the western shoreline near residential property and public walking trails. The Companies estimated the average total PAH (TPAH) concentration of Layer 101 at approximately 34 milligrams/kilogram (mg/Kg), with a detected maximum of 75 mg/Kg.

Layer 102 is a relatively discreet one- to two-foot-thick layer of heavily contaminated sediment located throughout the Bay, with areas up to eight- to ten-feet-thick along the eastern shore. The Companies estimated the average TPAH concentration in Layer 102 at approximately 2,242 mg/Kg, with a detected maximum concentration of more than 35,000 mg/Kg.

In the northeastern portion of the Bay, PAH contamination is also present in the underlying native peat or clayey silt sediment (Layer 103). Layer 103 is approximately 0-8 feet thick. The Companies estimated the average TPAH concentration in Layer 103 at approximately 5,980 mg/Kg, with a detected maximum concentration of 23,747 mg/Kg.

Layers 101, 102 and 103 contain contaminants at concentrations that exceed the MPCA RAOs and Cleanup Levels (see Section 3). The pre-industrial layer (Layer 104) below the

contaminated industrial layers (Layers 101, 102 and 103) does not contain contaminants at concentrations above the MPCA RAOs and Cleanup Levels.

Gas bubbles generated by anaerobic activity (microbes that live in the absence of oxygen) within the sediment carry contaminated sediment up to the water surface; when the bubbles burst, the entrained sediment falls to the sediment surface. Where oil is present, the sediment entrained with bubbles also contains oil, which spreads a sheen on the water's surface, creating an oil bloom. The oil blooms have been largely contained in the Bay by oil booms in the past three years.

Numerous processes act on the ground water/sediment/suface water interface in Stryker Bay including: upward advection (flow) of groundwater and downward flow of surface water into the sediment, diffusion of chemicals from the sediment to the water, new sediment deposition, bioturbation (mixing of sediment by organisms), biodegradation, mixing, and redistribution from bed shear induced by waves, prop wash, currents, and occasional anchoring. Within the Bay, ice usually freezes to the bed around the perimeter and thaws in place. Some of these processes deliver PAHs to the surface; others dilute, degrade, and physically redistribute the PAHs.

2.3.2 The Slips

Each of the two slips includes an artificially deepened (dredged) shipping area where depths range up to 28 feet, a transition slope, and a shallow area. The shallows of Keene Creek Bay/Slip 7 are larger than those of Slip 6. Slip 6 is approximately 15 acres in size and Keene Creek Bay/Slip 7 (including the 48-inch outfall area and the Minnesota Channel discussed below) is approximately 34 acres in size. The surrounding land use is industrial and the land consists largely of industrial fill, including slag from the former steel plant, which was placed in the bed of the St. Louis River over decades of maritime and industrial activity.

A wetland is located west of the shallows of Keene Creek Bay/Slip 7. A layer of hard slag is present along the western shore of Keene Creek Bay/Slip 7, which produces a broad, flat shallow shelf that is overlain by fine-grained contaminated sediment or peat. PAH-contaminated sediments are located near the surface throughout most of the slips and vary from less than one foot thick to more than 10 feet thick (Figure 2.2-2). The detected maximum TPAH concentration in Slip sediments is more than 340,000 mg/Kg. Some of the sediments produce oil blooms when disturbed. Like Stryker Bay, ice typically thaws in place in the slips.

2.3.3 The River Channel Area

The river channel portion of the SLRIDT site includes the outlets from Stryker Bay and the slips, the shallows between the outlets, and the main navigation channel. A small portion (approximately 0.3 acres at the mouth of Slip 6 and 1.1 acres in the Minnesota Channel – the Federal navigational channel) lie within the waters of the State of Wisconsin.

This River Channel Area is subject to a different set of forces than the more protected Bay and slips because it is adjacent to or part of the main channel. The area includes a 23-feet-deep dredged Federal navigation channel. The adjacent waters are much shallower. Slopes as steep as five to one connect the shallows to the deep channel. The adjacent land use is industrial and

consists of industrial fill. A wetland is located west of the mouth of Stryker Bay and along the shore of the peninsula between the slips.

The 48-inch outfall area is located on the tip of the 54th Avenue Peninsula between the slips. This area is called the 48-inch outfall area because industrial wastewater was discharged here from a ditch and later through a 48-inch diameter pipe to the river. Portions of the pipe were removed as part of the SOU remedial actions. Originally waste from Area C Pond was discharged to Keene Creek Bay. A bed of hard slag caps the shallows between the slips and creates a sandy shallow wave-washed surface. Contaminated material is draped down the slopes, with the most contaminated area to the southeast (Figure 2.2-3).

Processes that act or acted on the sediment/water interface include erosion along the shore of the 54th Avenue Peninsula and redistribution within the shallows from bed shear induced by waves, ship props and side-thruster wash, currents, and anchoring. Ice push (ice that pushes shallow sediments along shorelines) occurs in the shallows in this area.

2.4 Human Health Risks

Human exposure to contaminants in the sediments and surface water at the SLRIDT site may occur through several means including ingestion of water and suspended sediment, absorption through the skin due to contact with water or sediment, inhalation of contaminants, and eating contaminated fish. Swimming, boating, wading, and natural processes such as waves, currents, ice, and sediment burrowing by organisms can disturb the sediments resulting in the release of contaminants into the water (see Figure 2.3-1).

A Human Health Screening Evaluation (HHSE) for the SedOU was prepared by the MPCA in 1997 and updated in February 1998 and November 1999 to assess the potential health risk to people who would most likely be exposed to contaminants in the sediment and water at the SLRIDT site – people wading and swimming in the Bay.

The screening evaluation indicated that cPAHs are the primary contaminants of health concern although mercury may be of concern in localized areas, and that additional action to address contamination at the SLRIDT site, based on potential human contact with sediments, is warranted (Appendix 2A). Based on the limited available data, MPCA concluded that concentrations of the cPAHs at the SLRIDT site posed an unacceptable risk to human health. Additional sediment sampling performed at the Site in 2001 to better characterize the extent and magnitude of contamination provides supporting documentation of elevated concentrations of PAHs in the sediments and provides greater weight of evidence that the risk estimates for the SLRIDT site exceed the target risk level of one additional cancer per 100,000 chronically exposed people (one in 100,000 or 1E-5).

The MPCA used recently revised EPA dermal risk assessment guidance and child specific exposure factors to update the exposure scenarios and parameter inputs of the 1997/1998/1999 HHSE (Appendix 2A).Utilizing the exposure scenarios and parameters described in the attachments to Appendix 2A to calculate a RAO and Cleanup Level corresponding to a target risk level of 1E-5 results in a sediment concentration of approximately 1 mg/Kg as benzo(a)pyrene (BaP) equivalents to provide a reasonable level of protection of public health and welfare.

In addition, the Minnesota Department of Health (MDH) has prepared several Health Consultations for the SLRIDT site. The most recent Health Consultation (MDH 2003), focused on potential human exposure to contaminants during any cleanup activities, and in the future. The Health Consultation recommended a pilot study to evaluate air emissions while dredging; a detailed air monitoring plan; monitoring dredging sediment residue; isolation of the containment facility from impacts to surface water and ground water; monitoring and minimization of contaminant releases during cap application; detailed long-term monitoring, maintenance and repair strategies for the cap and confined disposal facility; and addition of monitoring for an extended list of cPAH and chlorinated organic compounds. MPCA has taken these recommendations into account in evaluating remedy alternatives for the SedOU and in the remedy which is selected in Section 8.0 of this ROD.

Human health risk evaluations performed by the MPCA and MDH indicate that additional action is warranted based on elevated risk estimates due to direct and/or indirect contact with the sediments. It is the judgment of the MPCA that additional action is necessary to protect the public health and welfare from actual or threatened releases of hazardous substances into the environment at the SLRIDT site.

Note: There currently is a fish consumption advisory on the lower portion of the St. Louis River from Scanlon to Lake Superior (which includes the SLRIDT site) because of the presence of polychlorinated biphenyls (PCBs) and mercury. PCBs have not been identified as a contaminant of concern at the SLRIDT site. The public should follow these advisories when eating fish from this portion of the river.

2.5 Ecological Risks

There are several pathways by which ecological receptors (plant and animal life) might be exposed to contaminants in the sediments at the SLRIDT site (Figure 2.3-1). Direct environmental exposure pathways include direct contact with contaminated sediments or water by benthic invertebrates, amphibians, reptiles, fish, mammals, birds and plants; and ingestion of sediments by sediment dwelling organisms, and fish and wildlife which feed on invertebrates or plants living in sediment. Indirect exposure pathways include ingestion by fish or wildlife of invertebrates, plants or fish which have bioaccumulated sediment contaminants in their tissues.

Comparison of SLRIDT site sediment contaminant concentrations with published sediment quality guideline values indicated that significant toxic effects to benthic invertebrates were predicted at the SLRIDT site, primarily due to PAHs, but also possibly from metals. Several site-specific studies have been conducted to determine whether effects are actually occurring to ecological receptors at the SLRIDT site. Field data collected to evaluate benthic community structure indicated that the benthic invertebrate community was degraded at the site in comparison to other areas in the St. Louis River (MPCA 1999b). Sediment toxicity testing conducted at two locations on the SLRIDT site for the EPA RE-MAP study and at 12 locations by the RPs for risk evaluation (IT 1997a) indicated that PAHs in SLRIDT site sediments caused toxic effects including reduced survival and growth in two species of benthic invertebrates in short term laboratory toxicity tests (MPCA 1999b). In addition, laboratory bioaccumulation testing at a single location on the SLRIDT site indicated that benthic invertebrates were likely accumulating significant body burdens of PAHs (Thijssen 1997).

These data, although providing evidence of risk to ecological receptors, were insufficient for determining threshold concentrations required for the MPCA to develop RAOs and Cleanup Levels for the SedOU. Therefore, based on the recommendations of a Technical Advisory Group (TAG) comprised of experts from several resource agencie,s the MPCA collected more detailed ecological effects data in 2001. This data included longer term laboratory toxicity tests on three species of benthic invertebrates, laboratory toxicity testing on two species of aquatic plants, laboratory bioaccumulation testing in a benthic invertebrate, and measurement of tissue residues of contaminants in benthic invertebrates, fish and aquatic plants collected from the field. Sediments for testing were collected from 14 locations on the SLRIDT site as well as 5 locations on an upstream reference area, and included a gradient of contaminant concentrations so that effects and tissue residues could be related to sediment concentrations. Details of the data collected and analyzed are included in Appendix 3.

The results of these analyses indicated that surface sediments at most areas of the SLRIDT site were toxic to benthic invertebrates causing reduced survival, growth, and emergence of adults at relatively low contaminant concentrations. Survival was further reduced upon brief exposure to moderate levels of UV light, indicating photo-enhanced toxicity, which is characteristic of PAHs. Some sediment samples were also toxic to aquatic plant seedlings. Laboratory-exposed invertebrates bioaccumulated PAHs to a significantly greater degree from SLRIDT site sediments than from the reference area, and biomass in these organisms was reduced in a concentration-dependent manner with tissue PAH residues. Field collected invertebrates had similar tissue residues of PAHs as the laboratory-exposed organisms, indicating that PAHs are bioavailable to organisms occurring at the SLRIDT site and accumulating to levels at which adverse effects were observed in the laboratory. Therefore similar adverse effects are likely occurring at the SLRIDT site. Aquatic plants and fish collected at the SLRIDT site also had elevated tissue residues of PAHs compared to the reference area.

MPCA staff concluded, based on multiple lines of evidence from all the studies, as well as toxic effects reported in the scientific literature, that PAHs in the site sediments are likely causing widespread adverse effects to organisms exposed directly and indirectly to them. Because these organisms comprise an important part of the aquatic ecosystem which MPCA is required to protect, and the habitat in these embayments is identified as a priority for protection and restoration in the St. Louis River, remedial action is necessary to eliminate or minimize the impacts of the sediment contaminants to the environment. The MPCA staff used the site-specific concentration-response effects data described above and detailed in Appendix 3 to develop ecologically protective RAOs and Cleanup Levels for remediation of sediments.

3.0 RESPONSE ACTION OBJECTIVES AND CLEANUP LEVELS

Remedial actions for releases and threatened releases of hazardous substances, and pollutants or contaminants, must be selected and carried out in compliance with State and Federal legal requirements. The general legal standard that must be met by any remedial action selected and implemented under MERLA is that the remedial action must protect public health and welfare and the environment. Minn. Stat. § 115B.17, subd. 1. Under the RFRAs issued to the responsible parties under MERLA, overall protection of public health and welfare and the environment is the "threshold criterion" that must be met for the MPCA to select any remedy for the SedOU. According to the RFRAs, this threshold criterion is met if a remedy achieves the RAOs and cleanup levels set by MPCA. RAOs and cleanup levels are determined by MPCA based on a number of considerations, including Applicable and Relevant and Appropriate Requirements (ARARs) such as air quality, water quality, and hazardous waste management laws and rules, and assessment of human health and ecological risk posed by the contamination.

The RFRAs, Exhibit A, Section IV.A., entitled "Establishment of Site specific Response Action Objectives and Cleanup Levels," provides as follows: "The MPCA Commissioner shall assess data as it is obtained through implementation of the Remedial Investigation (RI). When sufficient data exists, the MPCA Commissioner shall specify and notify the RP of the Site-Specific Response Action Objectives and Cleanup Levels for the contaminants, environmental media of concern, and exposure pathways associated with the SLRIDT site. The Site-Specific Response Action Objectives and Cleanup Levels shall be determined using ARARs, the Compilation of Ground Water Rules and Regulations MPCA Superfund Program, dated March 27, 1991, Attachment I, Federal and State sediments guidances, the results of Human and Ecological risk assessments and documented sediment remediation case studies." Since the issuance of the RFRAs, new guidance on sediment remediation has been developed and is used in the evaluation of remedy alternatives and development of this ROD.

Potential ARARs were identified and Preliminary Remediation Goals (PRGs) were developed by MPCA to be used in the evaluation of remedy alternatives in the FS. The following potential ARARs and PRG documents are included in Appendix 4 (MPCA 2003a).

- Attachment 5: Criteria, Advisories, Guidance and Applicable or Relevant and Appropriate Requirements for the St. Louis River/Interlake/Duluth Tar Superfund Site
- Attachment 6: Draft Remediation Goals.
- Attachment 7: MPCA Memorandum "Surface Water Quality Standards and Site Specific Criteria for the Proposed Wetland Cap at the St, Louis River Interlake/Duluth Tar Superfund Site".

The ARARs and RAOs and Cleanup Levels for the SedOU remedy are presented in Sections 3.1 and 3.2. The remedy alternative selected in this ROD must be implemented in accordance with the ARARs, RAOs and Cleanup Levels that apply to that alternative.

MERLA requires the MPCA to consider or make some determination about several other issues in order to select a remedy for the SedOU. These issues include setting requirements for remedy monitoring and maintenance, institutional controls, and other measures that are reasonably necessary to assure the protectiveness of the selected remedy over the long term. MERLA also requires the MPCA to consider the planned use of the property where the release is located when

determining the appropriate standards to be achieved by a remedy. And, MERLA requires the MPCA to make specific determinations when remedies involve permanent relocation of residents, businesses or community facilities, or off-site transport and disposal of the contaminated material. These other considerations that are required to be addressed under MERLA are presented in Section 3.3.

3.1 Applicable or Relevant and Appropriate Requirements and Related Permit Requirements.

This section explains the ARARs that have been determined to apply to one or more of the evaluated remedy alternatives for the SedOU. These ARARs were used in evaluating the remedy alternatives in the FS, and must be complied with in implementing the remedy that MPCA selects in this ROD. Some ARARs are associated with Federal, State and local environmental permit requirements. With respect to MPCA permit requirements, the MPCA will exercise its enforcement discretion to incorporate the substantive requirements associated with all MPCA permits into this ROD and/or, where appropriate, into the approved remedial design. Where permits from other Federal and state agencies are required in order to implement the selected remedy, the responsible parties will be expected to obtain those permits. Local permits also apply to some elements of the selected remedy. Under MERLA, Minn. Stat. § 115B.17, subd. 11, political subdivisions may not impose requirements for remedial action that conflict with a remedial action requested by the MPCA.

The ARARs for the SedOU remedy are organized by whether the requirement is associated with permit requirements or other environmental requirements. Non-MPCA permit-related ARARs are discussed first, followed by MPCA permit-related ARARs, and other ARARs not associated with permits.

3.1.1 ARARs Associated with Non-MPCA Permits

This section discusses Federal, state, and local permits, other than MPCA permits, that may apply to remedial action in the SedOU and refers generally to the substantive standards that the permitting agencies may impose. These permits are expected to be issued by the responsible government agencies.

3.1.1.1 Section 404 Permit (Clean Water Act)

Required for discharge of dredged or fill material into waters of the United States, this permit may be required for all the alternatives being considered, as both dredging and capping will involve such discharges. The US Army Corp of Engineers (COE) evaluates applications for Section 404 permits. Substantive requirements that may be incorporated within a Section 404 permit for off-site activities can be found in 33 CFR Parts 320 and 323. According to the Companies, the St. Paul District COE has determined that a Section 404 permit will not be required for on-site activities, but off-site actions such as a related mitigation project would require the permit.

3.1.1.2 Section 10 Permit (Rivers and Harbors Act of 1899)

A Section 10 permit is required for activities that will obstruct or alter any navigable water of the United States, including the construction of any structure in the water, the excavating from or

depositing of any material in the water, or the accomplishment of any other work affecting the course, location, condition, or capacity of the water. A Section 10 permit may be required for all the alternatives being considered, as both dredging and capping may involve such activities. The COE evaluates applications for Section 10 permits. The substantive requirements that may be incorporated within a Section 10 permit can be found in 33 CFR Parts 320 and 322.

3.1.1.3 Section 401 Certification (Clean Water Act)

Section 401 of the Clean Water Act, 33 U.S.C.§1341, requires that any application for a Federal permit that may result in a discharge to a navigable water must be accompanied by a certification from the affected state indicating that the discharge will comply with all applicable water quality standards and effluent limitations of the Act. Thus, a Section 401 certification or a 401 certification waiver for remedial action at the SLRIDT site would be necessary before the COE may issue a Section 404 permit, and a certification may be necessary before the COE may issue a Section 10 permit if that permit authorizes a "discharge."

3.1.1.4 Public Waters Permit (Minn. Stat. §103G.245)

A permit from DNR is necessary for any work in public waters that will change or diminish its course, current, or cross-section. Because all alternatives under consideration will involve dredging or capping a public waters permit from the DNR will be required. The substantive requirements that DNR may incorporate within its public waters permit are codified in statute and at Minn. Rules, ch. 6115. These requirements include compensation or mitigation for the detrimental aspects of any major change in the resource (Minn. Stat. § 103G.245).

The DNR has provided the MPCA with estimates of public water and wetland impacts and resultant estimates of compensatory mitigation required for the remedy alternatives considered for the SedOU at the SLRIDT site (DNR 2003a; DNR 2003b). According to the DNR, compensatory mitigation includes: (1) restoration; (2) creation; (3) enhancement; (4) exchange; and (5) preservation.

Depending on the remedy alternative selected, approximately 10-52 (+ or -) acres of compensatory mitigation will be required. Section 4.2 presents DNR estimated lost acres for compensation/replacement for each evaluated alternative. The replacement ratios assume that compensatory mitigation will occur on-site and be in the form of restoration or creation where impacted resources are being replaced at an equal or greater public value. If compensatory mitigation cannot occur on the SLRIDT site, then replacement ratios will be increased based on the location and type of the compensatory mitigation site. For comparison, the DNR provided estimates at a 1:1 replacement for on-site replacement, and at a 2:1 replacement for off-site replacement within the estuary. If replacement were to occur off-site and away from the estuary, the DNR would require a higher replacement ratio.

The following items will also be considered in determining the mitigation required or provided by a remedy alternative:

- Placement of suitable substrate for habitat purposes across the entire site.
- A permanent shoreline buffer zone feature.
- Adequate depths for navigation or replacement of navigational accesses for riparian owners.
- Other mitigation items as deemed necessary upon review of final construction plans.

The DNR has also stated that "The Public Waters Mitigation features presented to date are concepts that will require detailed plans and specifications showing the post-remedy configurations before they can be considered for approval by the DNR. In addition, wetland impacts must comply with the state Wetland Conservation Act (WCA)." (DNR 2003a).

3.1.1.5 Pretreatment/Disposal Permit (WLSSD Industrial Pretreatment Ordinance, Revised June, 1999)

A permit from the Western Lake Superior Sanitary District (WLSSD) will be necessary if any dredge water is discharged into the public sewers. The pretreatment standards that would likely apply are set forth in Table 3.1.1.5-1. WLSSD indicated that the permit will also include requirements to assure there will be no detrimental effects to their biosolids program. A WLSSD permit would also represent compliance with Minn. Rule, Part 4715.1600 and the MPCA water rules governing indirect discharges.

Table 3.1.1.5-1. Pretreatment Standards for Discharge to Sewer

Pollutant	Units	Limitation
Copper	µg/L	260
Zinc	µg/L	1600
Nickel	µg/L	1500
Cadmium	µg/L	30
Chromium	µg/L	1000
Lead	µg/L	220
Mercury	µg/L	0.3
Mineral Oil	mg/L	100
pH	Standard Units	>5.5
PAHs	mg/L	*

*PAHs are on the Toxic Pollutant List in the Industrial Pretreatment Ordinance and standards will be determined based on the treatment processes interference or toxic effect in their discharge. Preliminary limits for the site were set at 1 mg/L for each PAH and 3 mg/L for TPAH for those PAHs listed in the Ordinance. Final limits have not yet been set for this project by the WLSSD.

3.1.1.6 Wetlands Replacement Plan Approval (Minn. Stat. §103G.222); City of Duluth Wetlands Permit (Duluth City Code, § 51-31 et seq.)

Minnesota Statutes §103G.222 provides that a wetland replacement plan must be approved by the Local Governmental Unit, which in this case is the City of Duluth, before any WCA wetlands may be drained or filled, unless draining or filling falls within the "De Minimis" exemption or another exemption of Minn. Stat. §103G.2241. WCA wetlands are those wetlands that are not public water wetlands regulated by the DNR and COE. WCA wetlands would be located above the Ordinary High Water Mark.

The applicable Duluth city ordinance is more restrictive and prohibits the dredging or filling of wetlands over which the City has jurisdiction (1) without a special use permit, if the work involves certain types of wetland up to one acre in size, or (2) without a variance, if the work involves other wetlands.

Although each of the alternatives may affect WCA wetlands in Slip 7, it is most likely that those alternatives that involve capping of on-shore areas would impact a greater potential acreage of WCA wetlands. The city permit may be consolidated with the DNR public waters permit subject to agreement between the City and DNR.

3.1.1.7 Shoreland Management Permit (Duluth City Code §51-26 et seq.)

The City of Duluth requires a permit for any excavation or grading above the Ordinary High Water Mark within 300 feet of a river. Each alternative will involve some of these activities. The substantive requirements of this permit are found in the ordinance and may govern removal of natural vegetation, grading and filling, placement of roads, sewage and waste disposal, and setbacks. According to the Companies, because the City's authority over shoreland excavation activities is related to the MPCA's authority to permit stormwater discharges associated with construction activity greater than one acre, the City is considering deferring to the MPCA in the regulation of such activities at the SLRIDT site.

3.1.1.8 Other Miscellaneous Permits

Other City of Duluth permits may be required to route pre-treated dredge water through a force main to the WLSSD lift station. These permits could include approvals to work within City rights-of-way and approvals of pipeline materials and welds.

3.1.2 ARARs Associated with MPCA Permit Requirements; Incorporation in ROD or Design Approval

This section discusses the applicable substantive requirements associated with MPCA permits. The MPCA will not issue permits for the implementation of the remedy but instead will incorporate these requirements into this ROD or will require incorporation of the requirements in the RD/RA Plan, which will provide more detailed specifications of the selected remedy and is subject to MPCA approval.

3.1.2.1 Surface Water Quality Requirements (Clean Water Act)

Discharges of pollutants to the St. Louis River associated with construction of the selected remedy will be subject to the substantive requirements applicable to a National Pollutant Discharge Elimination System (NPDES) permit. These discharges may include the discharge of capping material into the river during capping operations, the discharge of contaminants released and suspended by dredging operations, the discharge of treated dredge water during dredging operations, and the discharge of stormwater runoff from shoreland modifications. These four types of discharges will be subject to the same regulatory standards and controls that would apply under an MPCA permit, but those standards and controls will be enforced through this ROD and the RD/RA plan. The NPDES-related requirements for the SedOU remedy are detailed in Section 3.2.2., and are incorporated into the RAOs and Cleanup Levels for the remedy. A fifth type of discharge to the river - seepage from the CAD - would be addressed by the MPCA in its State Disposal System (SDS) requirements for the CAD, which are discussed in Section 3.1.2.2 immediately below.

After completion of remedial construction, all portions of the St. Louis River on the SLRIDT site will be once again subject, as they are now, to the surface water quality standards for Class

2B and outstanding international resource waters (OIRWs), as set forth in Minn. Rules, chs. 7050 and 7052, and to the additional surface water quality standards for the St. Louis River set forth in Minn. Rules ch. 7065.

3.1.2.2 State Disposal System Permit Requirements (Minn. Stat. §115.07, subd.1)

The placement of dredged sediment into an on-site CAD and any subsequent seepage from the CAD is regulated by the MPCA under the requirements applicable to an SDS permit. The legal requirements for an SDS are found in Minn. Stat. § 115.07, Minn. Rules, Parts 7065.0100 to 7065.0160 and in other MPCA water quality rules including Minn. Rules chs. 7050 and 7052. The standards and requirements for a CAD are similar to the standards and requirements that the MPCA will apply to capping of sediments at the SLRIDT site, as discussed in Section 3.2.

3.1.3 Other ARARs

The following substantive standards, though not associated with any permit requirements for any of the remedial alternatives, are either "applicable" or "relevant and appropriate" requirements that apply to the remedy alternatives considered for the SedOU.

3.1.3.1 Ground Water Quality

The uppermost aquifer at the SLRIDT site, which is found in the artificially filled areas of the Site (including 59th and 54th Avenue Peninsulas), is contaminated, but has not been shown to adversely affect the surface water or the deeper aquifers. Tests of the deeper aquifer have demonstrated that the deeper aquifer is not contaminated and is isolated from the uppermost aquifer by a continuous thick confining layer with an upward gradient. None of the remedial alternatives under consideration for the SedOU are predicted to affect the deeper aquifer. The remedy selected by MPCA for the SOU required the owners of the property above the uppermost aquifer to record restrictive covenants which prohibit construction of wells on that property.

Groundwater in the area of the SLRIDT site generally flows from the uplands to the estuary and discharges to the surface water. Therefore, for the SedOU, the primary concern of groundwater contamination is the potential impact it may have on surface water. If contaminated sediment is capped, the potential for contaminated groundwater to discharge to the surface water would be monitored in the cap and biota. If contaminated sediment is dredged, it may be necessary to monitor groundwater near the groundwater/surface water interface and surface water standards would apply (Appendix 5).

3.1.3.2 Air Quality Standards

Ambient Air Quality Standards. During remedy construction, activities such as transportation, storage and placement of capping material may result in particulate matter becoming airborne. Minn. Rules ch. 7009 establishes ambient air quality standards for criteria pollutants regulated under the Clean Air Act. The ambient air quality standards for particulate matter that will apply are set forth in Table 3.1.3.2. Compliance points will be selected in accordance with Minn. Rules ch. 7009.

Table 3.1.3.2-1 Ambient Air Quality Standards

Pollutant	Primary/Secondary Standard	Averaging Times
Particulate Matter (PM_{10})	50 µg/m^3	Annual
	150 µg/m^3	24-hour
Particulate Matter ($PM_{2.5}$)	15 µg/m^3	Annual
	65 µg/m^3	24-hour

Hazardous Air Pollutant Control. Naphthalene, one of the PAHs present in the contaminated sediments, is regulated as hazardous air pollutant (HAP) under Section 112 of the Clean Air Act. EPA has adopted regulations for emissions of HAPs during remedy implementation activities at Superfund and other similar remediation sites (40 CFR §§ 63.7880-63.7597). These regulations do not apply to the SLRIDT site because it is not co-located at a facility with another stationary source of HAPs (such as a refinery or power generating plant). Under MERLA, the SedOU remedy must still be conducted in a manner that is protective of public health with regard to Naphthalene emissions. A site-specific RAO for Naphthalene emissions during remedy construction is set forth in Section 3.2.4 below.

Airborne Particulate Matter. Control of the generation of airborne particulate matter during remedy construction is regulated in Minn. Rule 7011.0150. Measures to control dust which may be generated during remedy construction activities such as transportation, storage and placement of capping material will be addressed in the RD/RA plan. Appropriate and reasonable precautions will be taken to prevent the emission of fugitive dust beyond the boundaries of the Site.

3.1.3.3 Noise Control

Minn. Rules ch. 7030 establishes noise standards for various land uses. The noise standards that will apply to the selected remedial action are set forth in Table 3.1.3.4-1. Compliance points will be selected in accordance with Minn. Rules ch. 7030.

Table 3.1.3.3-1. Noise Standards

Noise Area Classification	Daytime Units		Nighttime Units	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

1. Residential.
2. Includes most businesses.
3. Manufacturing and Industrial (would includes railroad tracks and maritime shipping).
4. For details on Noise Area Classification, see Minn. Rule ch. 7030.0050

"L_{10}"means the sound level, expressed in dB(A) which is exceeded 10 percent of the time for a one hour survey, as measured by test procedures approved by the commissioner.
"L_{50}" means the sound level, expressed in dB(A) which is exceeded 50 percent of the time for a one hour survey, as measured by test procedures approved by the commissioner.
"Daytime" means those hours from 7:00 a.m. to 10:00 p.m.
"Nightime" means those hours from 10:00 p.m. to 7:00 a.m.

dB(A) means a unit of sound pressure level expressed in decibels (dB) and A-weighted. Decibel means a unit of sound pressure level, abbreviated as dB.

The compliance monitoring locations will be determined at a later date but will be selected in accordance with Minn. Rules ch. 7030.

3.1.3.4 Waste Management

EPA guidance has consistently stated that Superfund remedies involving movement of contaminated material within the area of a Site where such material is already located (sometimes referred to as "area of concern") do not create a "waste" that is subject to RCRA or other waste management requirements. Thus, solid and hazardous waste management requirements will not apply to SedOU remedy alternatives that involve capping contaminated sediment in place, or dredging and consolidation of contaminated sediment in a CAD located within the contaminated sediment area on the Site. In addition, solid and hazardous waste management requirements would not be considered "relevant and appropriate" for capping or on-site containment in a CAD because they regulate land disposal, not management of submerged sediments. However, an on-site CAD would be subject to the requirements that apply to an SDS facility and to the RAOs and Cleanup Levels that are set by MPCA for protectiveness of a cap.

Remedy alternatives that require contaminated sediment to be moved from a submerged condition within the area of concern on the site to an off-site land disposal site, are considered to generate waste which must be managed under applicable waste management requirements. Either solid or hazardous waste requirements would apply depending upon the nature of the waste. It is not expected that dredged sediments removed off-site from the SedOU would be considered hazardous wastes under either federal or state law. Testing of a mixture of sediment from a previous interim response action at Slip 6 and remediation soils from the SOU showed benzene was not detectable in the Toxicity Characteristic Leaching Potential (TCLP). Past TCLP testing of sediment investigation wastes (consisting mostly of sediment mixed with some disposable sampling materials), which was undertaken prior to their off-site disposal, indicated they were not hazardous waste.

If, upon testing, the dredged sediments are determined to be hazardous wastes, then off-site management of the sediments would be subject to the Minnesota hazardous waste rules, Minn. Rule, ch. 7045, or similar rules of another state where the waste would be managed. These rules generally impose storage and transportation standards and require disposal at a permitted hazardous waste facility. If dredged sediments are considered solid wastes, off-site disposal of the sediments would be subject to Minn. Rule ch. 7035 or similar rules of another state where the waste would be managed, which generally require that solid wastes be sent to a permitted solid waste disposal facility. Cost estimates developed by the Companies assume that any sediment disposed of off-site will be considered solid, rather than hazardous, wastes. If such sediment was determined to be hazardous wastes, then the cost of that alternative would increase substantially.

3.1.3.5 Well Construction, Maintenance, and Closure

Ground water monitoring wells used during the investigation of the SLRIDT site that are not needed for long-term performance monitoring of the selected remedy, or of the SOU remedy, will be sealed during the construction of the remedial actions. The provisions of Minn. Rules ch. 4725 will apply to such sealing. If any monitoring wells are constructed as a part of the selected

remedy, their construction, maintenance, and use will be subject to the applicable provisions of Minn. Rules 4725.0210 to 4725.3875.

3.1.3.6 Construction and Use of Public Sewers

Minn. Rules ch. 4715 governing the use of sewers and public water systems would apply if any dredge water is disposed of in public sewers (See Section 3.1.1.5).

3.1.3.7 Endangered Species and Other Ecological Concerns

Terrestrial, wetland, and aquatic vegetation mapping has been completed and wildlife and fish surveys have been conducted and documented on the SLRIDT site. None of these studies has identified any threatened or endangered species on the SLRIDT site. The Minnesota Natural Heritage Information System Database, operated by the DNR, indicated no threatened or endangered species on the SLRIDT site. The DNR recommended considering silt curtains to protect sturgeon, a species of special concern, from the effects of suspended sediment during remedy construction. Such silt curtains or other control structures will be required as an engineering control as part of the RAOs during construction of the selected remedy. The Companies indicated that the DNR has also determined that it would establish no spawning restrictions at the SLRIDT site.

3.2 Site-Specific Response Action Objectives and Cleanup Levels

In order to meet the MERLA standard of overall protection of public health and welfare and the environment (the threshold criterion for selection of a remedy under the RFRAs issued by the MPCA), the SedOU remedy must achieve Site-Specific RAOs and Cleanup Levels set by the MPCA. The RAOs and Cleanup Levels applicable to the remedy are expressed as narrative standards and controls, as well as numeric values. Preliminary Remediation Goals or PRGs were used in the development and evaluation of the remedy alternatives in the FS and the information used to develop the PRGs was considered, among other information, in developing the RAOs and Cleanup Levels in this ROD.

3.2.1 Cleanup Level for PAHs

For purposes of the FS, the MPCA determined that all areas of the SLRIDT site containing sediments with a bulk sediment TPAH concentration exceeding 13.7 mg/Kg must be addressed by the SedOU remedy, either by dredging or capping or containment. This TPAH level was initially developed as a target Cleanup Level using Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems (MacDonald et al. 2000), which established freshwater sediment quality guideline values that are intended to be protective of the environment. MacDonald and others have found that 0.6 of the mean Probable Effects Concentration Quotient (mPEC-Q) approximates a 20% probability of observing sediment toxicity and it is proposed as a potentially acceptable (as a "Level II Sediment Quality Target") sediment quality target (SQT) (Macfarlane and MacDonald 2002; MacDonald and Ingersoll 2002; Crane et al. 2000). The mPEC-Q is calculated by averaging the ratios of the individual COCs to their Probable Effects Concentration (PEC) values. The PEC is a concentration at which significant toxic effects are predicted to occur. Because PAHs account for almost all of the mPEC-Q at the SLRIDT site, the MPCA used only the PEC for TPAHs to determine a cleanup level. Therefore the TPAH

cleanup level was determined by multiplying the TPAH PEC value of 22.8 mg/Kg by 0.6 to arrive at a cleanup level of 13.7 mg/Kg TPAH.

Section 2.5 and Appendix 3 discusses additional site-specific sampling and analysis performed by MPCA to further assess the site-specific ecological effects and risks of PAHs in the SedOU. Based on the evaluation of the site-specific toxicity data developed from this work, a range of concentrations representing toxic effects thresholds for different forms of aquatic life was observed. Although the most sensitive effects thresholds fell somewhat lower than 13.7 mg/Kg, the incidence of effects was relatively low between the Threshold Effects Concentration (TEC) of 1.6 mg/Kg and the target Cleanup Level of 13.7 mg/Kg, and increased dramatically between 13.7 mg/Kg and the PEC of 22.8 mg/Kg. Thus, it can be concluded that the SQTs used in determining the 13.7 mg/Kg target level for PAHs are reasonably good predictors of the actual observed toxic effects at the SLRIDT site, and that 13.7 mg/Kg is a reasonable Cleanup Level to apply to bulk sediment in measuring the protectiveness of the SedOU remedy.

In addition, Section 2.4 and Appendix 2A explain the derivation of a human heath sediment concentration of approximately 1 mg/Kg cPAH (as BaP equivalents) which can be judged to achieve an acceptable level of protection of human health. An estimate of TPAH concentration that would be consistent with 1 mg/Kg cPAH concentration can be calculated using the ratio of cPAHs to TPAHs observed for the sediments at the SLRIDT site. That ratio ranges from 1 in 5 to 1 in 20 cPAH to TPAH in sediments at the SLRIDT site. Thus, a range of 5 to 20 mg/Kg TPAH is a possible range of TPAH concentrations that would be consistent with the 1 mg/Kg cPAH concentration that is protective of human health at the SLRIDT site. MPCA has concluded that 13.7 mg/Kg TPAH, which is well within this range, is a reasonable Cleanup Level for TPAHs that is protective of human health.

Therefore, MPCA has set 13.7 mg/Kg TPAH as the Cleanup Level reasonably necessary to protect both public health and the environment from releases of PAHs, the primary contaminants of concern at the SedOU.

3.2.2 Area of Contaminated Sediments Required to be Remediated

The TPAH Cleanup Level of 13.7 mg/Kg is used to determine the limits of the sediment area required to be dredged or capped in any SedOU remedy. Figure 3.2.2-1 shows sediment areas exceeding 13.7 mg/Kg TPAH.

3.2.3 Surface Water Quality During Remedy Construction.

During remediation, the MPCA will consider the areas in which any capping, dredging, or CAD construction and filling are occurring as “treatment/work zones” to which the surface water quality standards normally applicable to the St. Louis River will temporarily not apply. These treatment/work zones will be physically separated from adjacent waters through the use of engineering controls such as single or multiple silt curtains, inflatable dams, or other measures. During construction of the remedy, any discharges occurring within those controlled treatment/work zones, such as the discharge of capping material during capping operations, the release of contaminants during dredging operations, runoff from disturbed shorelands, or seepage from the active CAD, will not be subject to water quality standards. Rather, water quality standards will apply outside of the treatment/work zone, beyond the outermost engineering

control structure where the water from the treatment/work zone is discharged to the river. Other discharges occurring during remedy construction to parts of the river not included in a treatment/work zone - including discharges of treated dredge water, and discharges of stormwater runoff from shoreland modifications outside of the treatment/work zones, will also be subject to regulation.

If water is discharged directly to the river, it will be treated on-site to a level that meets applicable MPCA surface water discharge standards. The water quality standards that will apply to these discharges are set forth in Appendix 5.

In general the water quality standards that will apply during remedy construction are as follows:

> Discharges From Treatment/Work And Stormwater Runoff Zones. The MPCA will apply Final Acute Values (FAV) for aquatic life established by Minn. Rules, chs. 7050 and 7052, adjusted, as appropriate, to account for significant differences between FAVs and chronic standards (see Minn. Rules, Part 7050.0222, subp. 7(E)) and to account for the hardness of the water. To account for the dissolved fraction see Minn. Rules, Part 7052.0360.
>
> Treated Water Discharge Directly To Surface Water. The MPCA will require the use of Best Technology in Process and Treatment (BT/PT) for discharge of treated dredge water where treatment technology can reduce the concentration of most compounds below their FAVs. In addition to the Appendix 5 requirements, discharges of mercury at the SLRIDT site would also be subject ordinarily to Minn. Rules, Part 7052.0310, subp.2, which regulates new or expanded discharges of bioaccumulative substances of immediate concern (BSICs) and bioaccumulative chemicals of concern (BCC) such as mercury. (Under this rule, discharges of mercury would be required to meet the chronic standard of 0.0013 μg/L. The chronic standard, rather than the maximum standard or FAV, would apply to mercury, because Minn. Rule, Part 7052.0210, subp. 3 prohibits mixing zones for BCCs.) However, Minn. Rules, Part 7052.0310, subp. 7, provides an exemption from the requirements of Part 7052.0310 for remedial actions taken pursuant to MERLA.

In the event that a standard is exceeded, further management practices may be required by the MPCA during remedy construction to reduce the amount of suspended contaminants escaping the treatment/work zone.

3.2.4 Air Quality During Remedy Construction.

Air emissions modeling performed by the Companies as part of the DGR indicated the potential for emission of naphthalene (a volatile PAH compound which is the active substance in mothballs and a HAP under the Clean Air Act) when sediments with high naphthalene concentrations are disturbed. Dredging of river sediments contaminated with similar concentrations of PAHs (including naphthalene) at the US Steel Grand Calumet River Site did not result in air emissions of concern. Nevertheless, ambient air monitoring for naphthalene will be conducted during all phases of in-water remedy construction for the SedOU.

Although air emissions of concern are not expected during implementation of any of the alternative SedOU remedies, as a precaution, air monitoring will be conducted during all phases

of in-water remedy construction to assure that nearby residents and non-site workers are not exposed to emissions which may result in unacceptable risk. Air monitoring locations will be established based on residential and non-site worker locations and local meteorological data.

Site-specific concentrations for responding to naphthalene air emissions are set forth in Table 3.2.4-1 and described in Appendix 2B. These concentrations have been established by MPCA based on MDH HBVs and OSHA PELs. MPCA will also require best management practices to minimize emissions during all in-water phases of remedy construction. If naphthalene air concentrations shown in the table are exceeded, the MPCA will require that in-water construction activities be discontinued and will consider relocating affected residents. As the half-life (the amount of time for a given concentration to be reduced by half) of naphthalene in the air is less than 24 hours, it is anticipated that discontinuation of in-water construction activities will alleviate risk.

Table 3.2.4-1. Response To Air Emissions During Remedy Construction

200-400 $\mu g/m^3$	Increased monitoring: In the event air concentrations of naphthalene reach 200-400 $\mu g/m^3$, monitoring frequency will be increased and steps will be taken to reduce emissions.
2,000 $\mu g/m^3$	Discontinuation of dredging or other water activities.
20,000 $\mu g/m^3$	Consideration of relocation of residents.

3.2.5 Vertical Extent of Remediation During Dredging

The vertical limits of dredging will be established during the design phase as necessary to achieve the TPAH Cleanup Level of 13.7 mg/Kg. The limits will be defined in the design phase by developing a dredge prism with slopes and elevations that define the mass of the identified contaminated sediment to be removed. Cores that identify the elevation of the top of native sediments or hard slag substrates will be used in the Bay and slips where non-native sediments are associated with the contamination. In the main river channel area beyond the limits of visibly non-native material, sediment chemistry from core samples will be used to define the depth of dredging. Dredging will incorporate an allowable six-inch overdredge amount below the dredge prism "neat line."

Environmental dredging is expected to leave some residual contaminated sediment. The residue is the result of resuspension and settlement of fine grained contaminated sediment from dredging activities and sloughing of soft high water content sediment along the edges of dredge cuts. In-place contaminated sediments that were not removed because the dredge prism design did not target them for removal is not considered dredge residual, and will be identified and addressed in the post dredge verification sampling. Even though environmental dredging is designed to minimize the potential for residue, some amount is likely to be present in some areas. The thickness of residue and the concentration of contaminants in the residue are very difficult to accurately predict. The MPCA will require a post-dredge cover to isolate, dilute and attenuate any potential dredge residue from exposure to aquatic organisms and humans. The cover would also be required by the DNR to restore bathymetry (water depth) and habitat substrate (bottom) as part of the public waters permit. The DNR will set the specific cover depth and composition requirements in the permit. The cover thickness will be roughly equal to the thickness that is removed by dredging. Generally, the cover is expected to be approximately two feet thick in

Stryker Bay, and the upper-most layer composed of loosely consolidated organic-rich material to enhance aquatic habitat.

3.2.6 Post Dredge Verification Sampling

Sediment sampling will be required in areas where contaminated sediment has been dredged to assure complete removal of contaminated sediment in accordance with the approved RD/RA Plan. The sampling will identify contaminated sediment, other than normal dredge residual, that should have been removed by dredging, including contaminated sediment within or outside of the dredge prism, and all such sediment shall be removed. For purposes of this section, normal dredge residual will be determined based on information developed from a pilot dredge test performed at the Site, which shall be documented in a report submitted to and approved by the MPCA. Post-dredge sampling will also identify any residual contaminated sediment remaining after dredging which exceeds normal dredge residual and may pose an unacceptable risk to the aquatic ecosystem and human health. If such residual contamination is identified, additional analysis of the quantity and concentration of the residual contaminated sediment will be required and a recommendation for addressing the residual sediment contamination shall be submitted for approval by MPCA, with action to be taken to implement the approved recommendation.

3.2.7 Long-term Performance of Dredged Areas.

Long-term compliance monitoring of dredged areas will be required by the DNR to monitor reestablishment of the aquatic community for a minimum of five years. No long-term compliance monitoring for COCs will be required by the MPCA for areas that are dredged and covered because the remedy requires contaminant mass removal to the extent that can reasonably be achieved by current environmental dredging technology, and post dredge verification sampling will be conducted to assure that contaminant removal is adequate to avoid unacceptable risks to the aquatic ecosystem and human health.

3.2.8 In-Situ Cap Construction Requirements.

The In-situ caps will consist of an Isolation Zone (IZ) and a Bioactive Zone (BAZ). The IZ is the portion of the cap that is applied directly over the contaminated sediments and is designed to isolate and attenuate the SLRIDT site contaminants that could potentially be transported upward into the BAZ at concentrations above the RAOs and Cleanup Levels by diffusion or advection transport mechanisms. The BAZ is the area within the cap above the IZ where significant biological activity may potentially be present.

The thickness and material specifications for the IZ will be determined based on pore water transport and attenuation modeling and will be approved in the remedial design document. In general, the IZ will be constructed with a sandy material and is expected to be approximately one foot thick.

The BAZ portion of the cap will become the new benthic substrate for the restored aquatic ecosystem. Therefore, contaminant levels shall not exceed the RAOs and Cleanup Levels for the COCs throughout the entire thickness of the BAZ. The BAZ material specifications will be based on hydrogeologic properties to allow appropriate advective pore water flow, settling characteristics, and DNR substrate requirements in the public waters permit. In general, the BAZ will consist of sandy material with the uppermost portion containing more fine grained material and organic matter for substrate enhancement. Final specifications will be approved in the RD/RA Plan and DNR permit. The site-specific BAZ thicknesses have been established by the MPCA as:

- 1 meter below the cap surface in post cap surface elevations greater than 594 feet Mean Sea Level (MSL) (~8 foot post cap water depth).
- 0.5 meter below the surface in post cap surface elevations less than 594 feet MSL (~8 foot post cap water depth).

The 8 foot water depth cut-off is based on the depth at which light penetration will likely limit plant growth. The rational for establishing the required BAZ thicknesses is detailed in Appendix 7.

Root barriers which reduce the BAZ thickness to less than one meter in shallower water may be approved by the MPCA but, only in areas where DNR identified critical habitat where water depth is critical to the function and ecological services of Stryker Bay.

Root barriers in these limited areas may only be utilized if the barrier material specifications and design are approved by the DNR and MPCA. See Figure 3.2.8-1 for conceptual diagrams of the caps in various areas of the SLRIDT site. Activated carbon mats that also provide a root barrier function may be utilized as an additional reactive/absorptive IZ layer within the cap, but are not intended to reduce the required thickness of the BAZ or IZ.

3.2.9 Long-Term Performance of Caps; Attainment of Cleanup Levels for Contaminants of Concern.

Caps that are part of the SedOU remedy, including the cap that is placed over any CAD that is part of the remedy, must attain all RAOs and meet Cleanup Levels for the COCs for the duration of contaminant isolation and storage at the Site. By attaining RAOs and meeting Cleanup Levels, the caps will not only minimize or prevent exposure of human and aquatic life to contaminated sediments, but will also protect surface water from migration of potentially contaminated ground water from below the contaminated sediment. The RAOs and Cleanup Levels will be applied to bulk sediment beneath the caps and to biota in the surface water. The MPCA developed the RAOs and Cleanup Levels based on, among other things site-specific, ecological effects data, water quality rules and guidance (surface water and ground water), and sediment quality target values. The RAOs and Cleanup Levels will be protective of public health, and aquatic plant and animal communities.

<u>Bulk Sediment</u>

The site-specific Cleanup Levels that will apply to bulk sediment in a cap are:

- For TPAH: 13.7 mg/Kg;

- For Metals (Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, and Zinc): 0.6 times the mPEC-Q based on Level 2 SQTs; and
- For Mercury: 0.3 mg/kg, the MPCA calculated upper limit ambient concentration in the St. Louis River estuary.

Section 3.2.1 describes the derivation of the Cleanup Level of 13.7 mg/Kg for TPAHs.

Because there were not clear cut concentration effect relationships between site-specific testing endpoints and metals concentrations (see Appendix 3), in general, MPCA was unable to calculate a site-specific Cleanup Level to use for measuring the protectiveness of caps with respect to metals. Therefore, the MPCA utilized the Level 2 SQTs to derive an mPEC-Q Cleanup Level for metals. For the mercury Cleanup Level, the MPCA calculated an ambient mercury concentration by using all available St. Louis River sediment data and the State of Washington's methodology for determining a background concentration (Washington State 1992 and MPCA 2001).

The Cleanup Levels stated in this section are set at levels that protect aquatic life from the sediment pathway of exposure in the caps. In order to determine that the caps are also protecting aquatic life (benthic invertebrates) from the pore water pathway of exposure in the caps, bulk sediment sampling results will be compared to protective pore water criteria using EPA sediment to pore water equilibrium partitioning methodology and a toxic unit approach. The pore water RAO and Cleanup Level for PAHs is based on the toxic unit additive model approach set forth in the EPA's Equilibrium Partitioning Sediment Benchmark for the Protection of Benthic Organisms (EPA 2002a). Because sampling and measuring PAHs in pore water is problematic, pore water concentrations of PAHs will be calculated from measured sediment concentrations by using EPA's carbon-normalized equilibrium partitioning model. Toxic units (the ratios of predicted pore water concentrations of individual PAHs to their respective EPA Final Chronic Value water concentrations) will be calculated and summed. A sum of toxic units greater than 1.0 implies that toxic effects are likely due to the mixture of PAHs. Therefore, to demonstrate the cap is protective of the benthic invertebrate/pore water pathway the MPCAs RAO and Cleanup Level for PAHs in pore water is a sum of PAH Toxic Units less than or equal to 1.0.

Bulk sediment and pore water within the BAZ of a cap must not be impacted with contaminants above MPCA Cleanup Levels for the duration of contaminant storage or until the contaminants have degraded to levels that no longer pose a risk to human or ecological receptors. The compliance point for cap performance monitoring will be at the base of the BAZ. The methodology, number, distribution, and frequency of the cap performance monitoring points for bulk sediment will be determined and approved by the MPCA in the RD/RA Plan and O&M Plan.

Biota

The MPCA will also compare concentrations of PAHs and mercury in fish or benthic invertebrate tissue to measure protectiveness of the cap for human and ecological receptors through the food chain pathway.

The fish or benthic invertebrate tissue residue concentrations of PAHs and mercury will be compared to reference area sampling results. If the biota monitoring within capped areas of the SLRIDT site indicate that PAHs or mercury are being transferred up the food chain at levels above reference area concentrations, further investigation will be required to determine whether RAOs and Cleanup Levels are being met in the cap. If non-compliance is found, actions will be required to correct the non-compliance. The methodology, number, distribution, and frequency of the cap compliance monitoring points for biota will be determined and approved by the MPCA in the RD/RA Plan and O&M Plan.

3.3 Other Considerations Under Minnesota Environmental Response and Liability Act

Sections 3.1 and 3.2 set forth the regulatory requirements, RAOs and Cleanup Levels that must be met by a SedOU remedy to meet the legal standard for a remedy under MERLA and the threshold criterion for remedy selection under the RFRAs: protection of public health and welfare and the environment. A remedy, as defined under MERLA, must also include any monitoring, maintenance and institutional controls and other measures that MPCA determines are reasonably necessary to assure the protectiveness of the selected remedy over the long term. It is particularly important to consider the requirements for long-term assurance of protectiveness where the SedOU remedy alternatives involve the use of capping or containment to manage contaminated sediments within the SLRIDT site. Some requirements may also be necessary to assure long-term protectiveness of alternatives that involve dredging and off-site disposal of contaminated sediment. The first part of this section discusses more specifically the remedy elements that MPCA determines are reasonably required to assure long-term protectiveness of each of the SedOU alternative remedies evaluated for purposes of this ROD.

In addition, MERLA requires the MPCA to consider the planned use of the property where the release of contaminants is located when determining the appropriate standards to be achieved by a remedy. MPCA's consideration of planned property use in setting the RAOs and Cleanup Levels for the SedOU remedy is discussed in this Section of the ROD.

Finally, MERLA requires the MPCA to make specific determinations when remedies involve two particular activities or methods for addressing contamination. First, when a remedy includes costs of permanent relocation of residents, businesses or community facilities, the MPCA must make a determination that such a remedy is more cost-effective and environmentally preferable to alternatives that would involve off-site transport and disposal of the contaminated material. Second, when a remedy involves off-site transportation and disposal of contamination, such activities are not considered part of a remedy unless the MPCA makes certain determinations about the remedy. These two MERLA determinations, as they would apply to the SedOU alternative remedies, are discussed in this section.

3.3.1 Long Term Assurance of Protectiveness

A MERLA remedy must include measures that are reasonably required to assure the ongoing protectiveness of a remedy once the components of the remedy have been constructed and entered their operational phase. Such measures may include, but are not limited to, institutional controls, and monitoring and maintenance requirements. This section discusses the measures that MPCA determines are reasonably necessary to assure long-term protectiveness of each of the SedOU remedy alternatives considered for purposes of this ROD.

3.3.1.1 Institutional Controls

Institutional controls are legally enforceable restrictions, conditions or controls on the use of property, ground water or surface water at a Superfund site that are reasonably required to assure the protectiveness of a remedy or other response actions taken at the SLRIDT site. Areas of the SLRIDT site where contaminated sediments will remain in place after remedial construction, including a CAD and areas where sediment is capped in place, will be subject to institutional controls (such as easements and restrictive covenants) which are legally binding on current and future owners of the property to assure ongoing protection from disturbance of or exposure to the contamination. Restrictions on use may also be required for areas of the Site where contaminated sediments are dredged and where some residual contamination may remain after dredging is complete. Specific institutional controls for each of the remedy alternatives considered for purposes of this ROD are set forth in Section 4.2 under the elements of each remedy alternative. If ownership of property within the SedOU is transferred in the future, the transfer would trigger the applicable provisions of Minn. Stat. §115B.16, subd. 2, which requires an Affidavit Concerning Real Property Contaminated with Hazardous Substances to be recorded with the St. Louis County recorder by the owner of the property.

3.3.1.2 Long-term Operation and Maintenance, Monitoring and Contingency Action

All remedy alternatives will require post-construction monitoring, O&M, and contingency action to assure that ARARs, RAOs and Cleanup Levels that apply to the alternative are fully achieved and maintained over time. A remedy involving dredging and off-site disposal of contaminated sediment would require the least post-construction monitoring, O&M and contingency action because of the substantial reduction of long-term risk resulting from the mass removal of contaminated sediment from the SLRIDT site. Remedy alternatives involving long-term on-site capping and containment of contaminated sediments will be expected to meet ARARs, RAOs and Cleanup Levels for duration of storage or containment of contaminated sediments at the SLRIDT site. Thus, such remedy alternatives will require long-term monitoring to confirm that RAOs and Cleanup Levels are being met, and to detect non-compliance. They will also require O&M of the capping and containment structures to assure long-term integrity and functioning of the remedy. Finally, such remedies will also require planning and implementation of contingency action to respond to circumstances where the integrity or functioning of the remedy may be compromised.

Long-term monitoring requirements that would apply to on-site capping and containment of contaminated sediments would include, among other things, monitoring to assure that the CAD and/or Caps meet RAOs, Cleanup Levels and ARARs as discussed in this Section 3, by collecting and analyzing sediment, biota, and sediment pore water by equilibrium calculation and groundwater samples. Details of long-term monitoring requirements will be set forth in the O&M Plan. The O&M Plan must include an estimate of the cost to carry out the long-term monitoring activities required by the plan.

Because the caps will be designed to provide protection of surface water from potentially impacted ground water migration to surface water ground water monitoring adjacent to the caps would not be required. Where caps are not present adjacent to upland areas of contamination, ground water monitoring to demonstrate protectiveness of surface water will be necessary

An O&M plan will be required for all remedy alternatives, which sets forth the measures that will be taken to assure the maintenance, integrity and functioning of the remedy components in order to provide long-term protection of public health and the environment. The plan will include, as appropriate for the alternative that is selected, maintenance requirements for the CAD, caps, post-remediation bathymetry, habitat substrate, benthic invertebrate recolonization, and wetland establishment. The O&M plan must include a cost estimate for performing the activities included in the O&M plan.

In addition, a contingency action plan will be required for a remedy that involves on-site, long-term capping or containment of contaminated sediments. The contingency action plan must provide for specific measures that will be taken to promptly and appropriately address circumstances and events that are not addressed by routine O&M and that pose a substantial threat to the continuing integrity and protectiveness of the remedy. At a minimum, the contingency action plan shall include the following requirements:

- If bulk sediment or calculated pore water in the cap or biota fails to meet the RAOs and Cleanup Levels as provided in Section 3.2.7, the following contingency actions will be implemented:
    - A work plan to further determine the extent and magnitude of the exceedance must be submitted to the MPCA within 30 days of documented noncompliance.
    - A remedial plan to bring the sediment remedy back into long-term compliance must be submitted to the MPCA within 90 days of documented noncompliance. The plan must consider potential DNR permitting and mitigation issues for the recommended actions.
- Implementation of the remedial plan shall commence within 30 days after approval of the plan by MPCA, which may include modifications deemed reasonable and necessary by MPCA.

The contingency action plan must include estimates of the cost to carry out the activities required by the contingency action plan. Contingency action does not include complete replacement of any major remedy component with a different component. If such complete replacement becomes necessary, it will be considered an additional remedial action subject to the selection process applicable under MERLA and any other governing legal documents.

The monitoring, O&M, and contingency action plans will be required as part of the RD/RA plan for the selected remedy, and will be subject to approval by the MPCA as part of that plan.

In addition to the requirements above for assuring long-term protectiveness of the SedOU remedy, performance of the selected remedial actions will be subject to review every 5 years pursuant to the Federal Superfund law.

3.3.1.3 Financial Assurance

The MPCA has determined that, in order to provide a reasonable degree of assurance that the remedy alternatives involving long-term on-site capping and containment of contaminated sediments will continue to protect public health and welfare and the environment over the long-term, financial assurance mechanisms will need to be established. The costs of long-term monitoring, O&M, and contingency action for a remedy involving on-site capping or

containment of contaminated sediments were not estimated by the Companies in the FS. Due to the number and complexity of the monitoring requirements, the size and scope of the remedy structures, and the extended period of time when compliance with RAOs and Cleanup Levels is required, it is reasonable to expect that these costs could be substantial.

The MPCA expects that the Companies will implement the selected remedy. The MPCA recognizes that the future existence and financial viability of these business corporations cannot be guaranteed for the period in which monitoring, O&M, and contingency action will be required for a remedy involving on-site capping or containment. Therefore, the MPCA finds that it is reasonably necessary to require RPs to demonstrate that adequate funds will be available to carry out these requirements over the long-term. MPCA further finds that, because of the scope of the long-term actions required and the length of time over which such actions may be required, it is reasonable to require that financial assurance assurance be demonstrated by either an irrevocable letter of credit or a fully funded trust fund. Other financial assurance mechanisms such as corporate financial (asset) tests, surety bonds and insurance, are far less reliable than a letter of credit or a fully funded trust fund for several reasons. First, these other mechanisms are dependent on the future financial or organizational viability of the Companies or of the insurance carrier or surety company. Second, mechanisms such as insurance and surety bonds are subject to coverage disputes that could prevent or delay the MPCA from taking the actions necessary to protect public health and the environment.

Any remedy that includes on-site long-term capping or containment of contaminated sediments will include requirements that those parties demonstrate that sufficient financial resources are available over the life of the operation of the remedy to pay the estimated costs of implementing the long-term monitoring, O&M, and contingency action plans, as contained in the RD/RA plan approved by the MPCA. Demonstration of sufficient financial resources will require either an irrevocable standby letter of credit or a fully funded trust fund, which must be established under documents substantially in the form provided in Appendix 8.

3.3.2 Planned Use of Property

In a provision entitled “Cleanup Standards” (Minn. Stat. § 115B.17, subd. 2a), MERLA provides that when MPCA determines the standards to be achieved by response actions to protect public health and welfare and the environment from a release of hazardous substances, the agency must consider the planned use of the property where the release is located. The purpose of this provision of MERLA is to allow the MPCA to select cleanup standards that provide a level of protection that is compatible with the uses of the SLRIDT site property that can be reasonably foreseen. The specific property directly affected by the SedOU remedy is the aquatic portion of the SLRIDT site, consisting of Stryker Bay, Slip 6, Slip 7/Keene Creek Bay, and a small part of the navigation channel. The remedy would also affect the areas of adjacent property used for buffer zones or conservation easements.

The cleanup standards described in this ROD (ARARs, RAOs and Cleanup Levels) are based on protection of aquatic and semi-aquatic life and associated habitat, and protection of human health as affected by the food chain, direct ingestion and dermal contact. These cleanup standards will provide protection of public health and welfare and the environment that is consistent with any planned or potential future uses of the property within the SedOU, including natural resource and habitat restoration, navigation and recreational uses. These cleanup standards are also

compatible with the use of the adjacent land for residential, recreational, habitat restoration, or commercial and industrial use. However, components of some remedy alternatives such as capping and on-site containment of contaminated sediments will preclude some future uses of the property, will affect the type of habitat that is restored, and will require institutional controls that will restrict some future uses of portions of the SLRIDT site.

3.3.3 MERLA Determination Related to Relocation of Businesses

MERLA requires the MPCA to make specific findings supporting selection of a remedy that involves permanent relocation of residents, businesses and community facilities. Minn. Stat. § 115B.02, subd. 16(b)(2), defines "remedial action" to include permanent relocation costs for businesses "when the agency determines that, alone or in combination with other measures, relocation is more cost-effective than and environmentally preferable to the transportation, storage, treatment, destruction, or secure disposition off-site of hazardous substances, or pollutants or contaminants, or may otherwise be necessary to protect the public health or welfare." If an evaluated Alternative involves permanent relocation of Hallett Dock Company from the property it currently owns at the SLRIDT site, the MPCA must make the above determination if it selects such a remedy in this ROD. The MPCA will make this determination, if necessary, after the evaluation and comparative analysis of the remedy alternatives in Sections 5 and 6 of this ROD.

3.3.4 MERLA Determination Related to Offsite Transportation and Disposal of Contaminated Material

MERLA requires the MPCA to make specific findings supporting selection of a remedy that involves offsite transport of contaminated materials or secure disposition offsite. Minn. Stat. § 115B.02, subd. 16(c), defines "remedial action" to exclude "offsite transport" and "secure disposition offsite" of contaminated materials unless the agency determines that these actions:

> (1) are more cost-effective than other remedial actions; (2) will create new capacity to manage hazardous substances in addition to those located at the affected facility . . . ; or (3) are necessary to protect the public health or welfare or the environment from a present or potential risk which may be created by further exposure to the continued presence of the hazardous substances, pollutants or contaminants, or contaminated materials.

To select a remedy for the SedOU that involves offsite transport and disposal of contaminated materials, the MPCA must be able to find that at least one of the preceding requirements has been met. If an evaluated alternative involves transportation and secure disposal off-site of contaminated sediment, the MPCA must make the above determination if it selects that alternative in this ROD. The MPCA will make this determination, if necessary, after the evaluation and comparative analysis of the remedy alternatives in Sections 5 and 6 of this ROD.

3.4 Contaminated Sediments Within State of Wisconsin.

The MPCA has been coordinating with the Wisconsin Department of Natural Resources (WDNR) regarding the cleanup of contaminated sediment in the Wisconsin portion (approximately 1.4 acres) of the SLRIDT site. WDNR, like the MPCA, will require remediation

of the area of contaminated sediment that exceeds the 13.7 mg/Kg TPAH Cleanup Level at the SLRIDT site within Wisconsin waters. WDNR has provided specific requirements for dredging and post remediation monitoring of sediments in Wisconsin waters, which are included as Appendix 9 to this ROD. These requirements are based on Wisconsin statutes and administrative rules and are subject to enforcement by the State of Wisconsin. Under the selected remedy, no fill material or structures shall be placed in Wisconsin waters for the purpose of capping of residual contaminated sediments, or for the construction of the CAD facility. Any placement of material or structures in Wisconsin waters would be subject to additional requirements under Wisconsin law.

4.0 TECHNOLOGIES AND RESPONSE ACTION COMPONENTS AND REMEDY ALTERNATIVES CONSIDERED BY THE MPCA

This section briefly identifies the technologies and response action components that were evaluated in the reopened RI/FS for the SLRIDT site. This section also provides a description of each of the four remedy alternatives evaluated in the FS, and a summary of treatability studies conducted to evaluate remedial technologies.

4.1 Technologies and Response Action Components

The following is a brief summary of technologies and response action components evaluated in the reopened RI/FS. For additional detail refer to the Revised FS (Service 2003).

Dredging. Twenty types of environmental dredge technologies were evaluated in the Alternatives Screening Report (IT 1997b). Detailed descriptions of the issues associated with dredging design are discussed in the DGR (SERVICE 2002, Appendix D3).

Air Emissions Control. Control technologies that constitute Best Management Practices were evaluated including floating covers, spray mists, powdered activated carbon (PAC) floating plastic balls, and foam for their ability to control emissions in an active dredge area and in the CAD.

Capping and Surcharging. Capping of contaminated sediments in place (in-situ) was evaluated with the following cap features in mind:

- Control of contaminant transport through the cap,
- Protection of aquatic ecology,
- Erosion control for the surface of the cap,
- Cap stability during placement on slopes and flat areas,
- Sediment gas management, and
- Maintenance of existing water depths.

Surcharging of capped areas in Stryker Bay was also evaluated. Surcharging is the placement of additional sand on top of the sand needed to construct the cap. The extra weight of the surcharged material accelerates and increases the consolidation of underlying sediments. After sufficient consolidation, the extra thickness of sand is removed, leaving a cap in place with the water depth restored.

Confined Aquatic Disposal Facility. Construction of an on-site CAD was evaluated for the disposal of dredged sediments.

Sediment Dewatering. Mechanically dewatering dredged contaminated sediment was evaluated in an on-site dewatering pond for treatment prior to off-site disposal.

Dredge Water Treatment and Disposal. Options for treatment and disposal of treated dredge water were evaluated. Dredge water treatment would be required prior to discharge of the water to the St. Louis River and/or WLSSD.

Transportation and Disposal of Dewatered Sediment. Transport of contaminated sediment by truck or rail to an off-site solid waste landfill approved for industrial wastes.

Institutional Controls. Types of institutional controls were reviewed to evaluate their ability to assure that remedies remain protective over time.

Environmental and Physical Monitoring. Environmental and physical monitoring requirements were evaluated for activities conducted during remediation and after remediation. The RD/RA Plan and O&M Plan, submitted for MPCA approval after remedy selection, will specify the monitoring to be conducted during remedy construction and the long-term monitoring required to assure that the completed remedy is protective.

Types of monitoring evaluated include:

- Bathymetry and other surveying to verify dredging depths, monitor settlement and erosion of caps and covers placed at the SLRIDT site, evaluate actual water depths, and monitor habitat potential in post-remediation water depths.
- Monitoring of benthic organisms and other biota such as birds and fish.
- Air monitoring.
- Surface water monitoring.
- Groundwater monitoring, including monitoring of groundwater to determine the rate and direction of groundwater flow, and its interrelationship with surface water.

- Visual examination of sediment cores.
- Bulk sediment chemistry monitoring.
- Pore water sampling.
- Physical, biological, and chemical analysis of capping material.

Wetland vegetation surveys.

Public Waters Mitigation. Type and cost of public waters mitigation were evaluated by the DNR and included in this ROD. DNR mitigation measures to address these requirements are discussed in Section 3.1.1.4.

Land Acquisition and Hallett Relocation. Land acquisition and relocation costs were evaluated in the SedOU FS for all remedy alternatives that modify the current land use.

4.2 Summary of Retained Alternatives

The No Action Alternative, used as a benchmark, and three other Alternatives specified in the Agreement between the MPCA and the Companies (MPCA 2003a, 2003b, and 2004) were evaluated by the Companies in the SedOU FS and were considered by the MPCA in selecting a remedy in this ROD. These four alternatives are described below.

4.2.1 Alternative 1 – No Action

Under the No Action Alternative no actions would be taken to alter existing SLRIDT site conditions. The No Action Alternative does not include any treatment, engineering controls, or institutional controls. This alternative does not include long-term groundwater monitoring. All

existing monitoring wells for the No Action Alternative would be abandoned as shown in Figure 4.2.1-1.

4.2.2 Alternative 2 – In-Situ Cap

This alternative would consist primarily of capping contaminated sediments in their current location (in-situ) with clean material. In-situ capping would be conducted in Stryker Bay, Slip 6, and Keene Creek Bay/Slip 7, and portions of the on-shore wetlands in Keene Creek Bay/Slip 7. Capping the sediments in Stryker Bay address the Basal Tarry Unit (Area F). There would be dredging within the Federal navigation channel near the 48-inch outfall. WDNR would also require dredging in the portion of the SLRIDT site located in Wisconsin. Dredged material would be placed in Slip 6, but not in a confined aquatic facility, and capped. The components of this Alternative are shown on Figure 4.2.2-1, and are further described below.

The FS Addendum estimated the in-situ contaminated sediment volumes exceeding the MPCA RAOs and Cleanup Levels within the aquatic portion of the SedOU to be approximately 501,000 to 609,000 cubic yards (Service 2004).

Dredging – Alt. 2. Under the In-Situ Cap Alternative, contaminated sediments located within the Federal navigation channel near the 48-inch outfall would be dredged. Approximately 1.4 acres (estimated at approximately 3,600 cubic yards) of sediments exceeding the WDNR Cleanup Level for TPAHs would be dredged from the Wisconsin part of the SRLIDT site (Figure 4.2.2-1). All dredged material would be placed in the deep portion of Slip 6 at its northern end where it would be capped along with the rest of the contaminated sediments in the slip.

Dredge Water Management – Alt. 2. The deposition area for dredged sediment at the head of Slip 6 would be segregated into a treatment/work zone using silt curtains. The deposited dredge material would displace some surface water, but no water would be removed from the treatment zone or treated. The displaced river water would be monitored beyond the outermost engineering control structure to meet FAVs in accordance with the RAOs and Cleanup Levels.

Capping – Alt. 2. The In-Situ Cap Alternative would consist of capping the contaminated sediments in Stryker Bay and in the boat slips to isolate the contaminants in place. Surcharging will not be used in Stryker Bay under this alternative.

The thickness of the cap would be as follows and as illustrated in Figure 4.2.2-1:

- Caps located on the on-shore side of the new shoreline would have a 4-foot cap.
- Caps located in off-shore areas with post-remediation depths less than 8-feet deep would have a 4-foot cap.
- Caps located in off-shore areas with post-remediation depths deeper than 8-feet would have a 2- to 2.5-foot cap.

Monitoring - Alt. 2. The In-Situ Cap Alternative would involve testing imported borrow material for caps, ambient air monitoring, surface water monitoring beyond the outermost engineering control structures, and coring and settlement monitoring in the cap areas for comparison to expected settlement. Wetland vegetation surveys would also likely be required by the DNR. Details of monitoring requirements would be included in the RD/RA Plan if this alternative were selected. Ambient air and surface water quality monitoring would be conducted

during in-water construction activities until the MPCA allows termination of testing based on the monitoring results.

During the remediation, surface water would be monitored outside the outermost engineering control structure for compliance with RAOs and Cleanup Levels. After remedial construction is complete, long-term monitoring of the BAZ for the COCs would be required in capped areas. In addition, biota will be monitored for potential accumulation of PAHs and possibly mercury. The caps would be monitored for erosion and repaired as necessary. Surface water monitoring after remediation would not be required because monitoring the capped sediment would detect any contaminants in bulk sediment and pore water at the base of the BAZ in the cap before its potential release to the surface water.

For Alternative 2, the potential for contaminated ground water to discharge to the surface water would be monitored in the cap and biota for compliance with RAOs, Cleanup Levels and ARARs.

Because the SLRIDT site is listed on the NPL and contamination would remain in place after completion of this remedial alternative CERCLA would require review of remedy every five years to assure it complies with RAOs, Cleanup Levels and ARARs.

Property Acquisition and Hallett Relocation - Alt. 2. Under the In-Situ Cap Alternative, it would be necessary to acquire access and property rights from Hallett. Hallett's deep draft shipping operations at Slips 6 and 7 would be required to cease or relocate because the caps would reduce the navigational depth of Slips 6 and 7 to a point where deep draft shipping operations would no longer be possible. The slips could potentially remain available for barge traffic if properly armored.

Changes to Existing Property Use - Alt. 2. The In-Situ Cap would permanently modify the current and planned riparian/property use of the Boat Slip 6, Boat Slip 7, and Stryker Bay. In-situ capping would make the Boat Slips 6 and 7 shallower, displacing the deep draft shipping operations. Although capping would cause the slips to be too shallow for deep draft ships, the slips could be used for barge operations. In addition, this alternative would convert most of the open water to wetlands and on-shore wetlands to uplands in Stryker Bay, thus eliminating the shallow sheltered bay conditions that currently exist. This would eliminate the riparian rights of property owners along Stryker Bay. The entrance from the river channel to remaining open water in Stryker Bay and the continued flow of its tributary creek through the Bay would be maintained.

Conservation easements would be established along SLRIDT site shorelines (riparian buffer zones) as shown in Figure 4.2.2-1 to enhance existing and re-established habitat. Stryker Bay landowners with riparian rights may require compensation or a dock located elsewhere.

Mitigation for Public Waters and Protected Wetlands - Alt. 2. As stated in Section 3.1.1.4, the DNR has provided the MPCA with estimates of public water and wetland impacts and resultant estimates of compensatory mitigation. The DNR estimates that approximately 52 acres of on-site waters or wetlands of equal or greater public value would be needed to replace public water and wetlands functions and values lost (DNR 2003b). Detailed plans and specifications showing

the post-remedy configurations would be required by the DNR to determine actual compensatory mitigation requirements (2003a).

Institutional Controls - Alt. 2. Institutional controls would be needed to assure the In-Situ Cap Alternative remains protective over time. The following institutional controls may be required for this alternative:

- Anchoring or other disturbance, temporary or permanent, may be prohibited within the footprint of the in-situ capped areas. Anchoring restrictions would be communicated with signs on shore.
- Docks, piers, or other temporary or permanent structures could not be constructed within the footprint of the in-situ capped area without a construction plan approved by the MPCA. In some circumstances, DNR and COE approval may also be necessary.
- Dredging would be prohibited without MPCA approval within the SLRIDT site remediation boundaries.
- It is assumed that there would be no institutional controls in the Wisconsin portion of the remediated area.

Schedule and Time Until RAOs and Cleanup Levels are Achieved - Alt. 2. Dredging operations would occur early in the remediation so that the dredged material could be placed at the head of Slip 6 before capping the Slip 6 area. Capping is expected to take about one construction season. This alternative is predicted to meet RAOs and Cleanup Levels at the conclusion of capping. Sequencing and duration of the construction of the components of this alternative would be refined in the RD/RA Plan should this alternative be selected.

4.2.3 Alternative 3 – Revised Dredge/Cap Hybrid

Alternative 3 consists of a combination of environmental dredging, in-situ capping, and dredged sediment containment. The components of Alternative 3 are illustrated in Figure 4.2.3-1 and described in detail below. Capping the sediments in Stryker Bay will address the Basal Tarry Unit (Area F).

Dredging – Alt. 3. Dredging of impacted sediment exceeding the MPCAs Cleanup Level for TPAHs would be conducted in approximately 25 acres of sediment throughout the SLRIDT site. Areas to be dredged include approximately 22 acres of contaminated sediment in Stryker Bay or about 70% of the area of Stryker Bay, 0.3 acres in Slip 6, 2 acres of on-shore wetlands in Slip 7, and 3 acres in the Minnesota Channel (see Figure 4.2.3-1). This estimate also includes dredging sediment that exceeds the Cleanup Level for TPAHs within Wisconsin waters in Slip 6 and the navigation channel.

Dredging in Stryker Bay would include most of the silty and sandy substrate areas, which are not compressible through surcharging. The areas to be dredged are not associated with the highest concentrations of naphthalene in the contaminated sediments. Dredging would be conducted in order to achieve mass removal of most of the contaminated sediment layer and to maximize restoration of pre-remedy water depth. The entrance to Stryker Bay would also be dredged to maintain adequate water flow into the Bay and recreational navigation access for shoreline owners, and other users. In the northernmost contaminated area, the DNR requested dredging to create a sediment trap for detritus delivered by the unnamed tributary stream.

Post-dredge cover material would be placed on the dredged areas (except dredged areas in Wisconsin waters) described above to isolate any dredge residual and restore pre-dredge bathymetry (depth) and provide a substrate for reestablishing habitat (sediment type) that meets DNR permit requirements.

Dredge Water Management – Alt. 3. Based on dewatering studies listed in Section 4.3, this ROD assumes that flocculation with chemicals would be used in a CAD to settle solids. Sand filtration would be used to further reduce solids to meet pre-treatment standards before discharge to the WLSSD sewer system. Backwash water would be returned to the inlet of the CAD. An additional pump lift station would likely be required to handle the 250 gallons per minute flow (per dredge) for discharge to the WLSSD sewer system and a pipeline dedicated to access the WLSSD force main lift station. To minimize the discharge, a dredge slurry system could be used which would recirculate settled water from the CAD to make up a slurry of about 16% solids to transport dredged sediment. Discharge of dredge water directly to the river would require additional treatment using Granular Activated Carbon (GAC) System to meet RAOs and ARARs.

Air Emission Controls – Alt. 3. Air quality monitoring and control measures would be conducted to assure protection of public health and the environment and compliance with RAOs during remedy implementation. Air emission modeling, discussed in Section 3.1.3.2, indicated a potential for increased naphthalene emission during dredging of sediments in the areas of highest naphthalene concentrations and during the placement of such dredged material in a CAD.

Because the areas of highest naphthalene concentrations (shown in mg/Kg dry weight in Figure 4.2.3-2) would be capped under this alternative (see Capping and Surcharging below), the likelihood of exceeding ambient air quality RAOs is significantly reduced. Response to air emissions during remedy construction would be implemented as shown in Table 3.2.4-1. Responses may include PAC, cover or other approved mitigation measures applied in the CAD during dredging and dewatering operations.

Capping and Surcharging – Alt. 3. All of the undredged portion of Stryker Bay (approximately 11 acres) would be capped and surcharged to restore pre-remediation bathymetry (water depth) and provide an appropriate substrate to reestablish habitat. Surcharging the sediments of Stryker Bay would compress and consolidate the underlying sediments. After consolidation is complete, the surcharge material would be removed to achieve desired water depths over the capped areas of Stryker Bay. The areas to be capped in Stryker Bay include the areas with highest Naphthalene concentrations in the contaminated sediment.

Capping of contaminated sediments would be conducted on all other remaining areas in Keene Creek Bay/Slip 7 that exceed the Cleanup Level for TPAHs (approximately 28 acres), including an area of on-shore wetlands of Keene Creek Bay/Slip 7.

Capped areas of the SLRIDT site would include:

- The areas of highest naphthalene concentrations on the east side of Stryker Bay,
- The peat areas shown in the substrate map (Figure 4.2.3-3) as this substrate is predicted to compress with minimal additional surcharge material,

- All of Slips 6 and 7 and one area of on-shore wetlands of Slip 7 that exceed the Cleanup Level for TPAHs as shown in Figure 4.2.3-1, including those areas with the highest naphthalene concentrations (Figure 4.2.3-2), but excluding contaminated sediments in Wisconsin waters, which will be dredged.

Capping and surcharging in Stryker Bay would be designed to isolate contaminants without reducing water depths and natural resource values significantly, thus preserving and restoring shallow sheltered bay conditions. Capping and surcharging in the Stryker Bay would also reduce potential air impacts, restore habitat substrate, improve ecological conditions of the shoreline, and diversify habitat.

Containment – Alt. 3. This alternative would also involve the construction of an approximately 15-acre CAD in Slip 6 to contain the dredged sediment. An earthen dike or sheet piling would be used to segregate dredge water in the CAD from surface water and the adjacent wetlands. The construction of sheet piling and end dike are described in the DGR (Service 2002; Appendix D3).

The dike would be located south of the dock structure in Slip 6 and will not extend into Wisconsin waters. This configuration is intended to provide necessary containment capacity; avoid the need to seal the cribbing of the dock wall against leakage of dredged material; and take advantage of the firmer sandy foundation at the south end of the slip.

The centerline of the dike is estimated to be located about 165 feet south of the south end of the dock wall Station 0+00. The CAD at this location would be able to store the expected volumes when filled to an elevation ranging from 596 to 600. During design, dredge volumes and CAD design details would continue to be evaluated.

The end of the dike would likely have 2:1 slopes and be constructed of granular fill. Operating water levels and details of the dikes and sheet piles would be developed in the RD/RA Plan. A 5-foot thick cap, designed and monitored in the same manner as other caps to be used in this Alternative, was assumed for the CAD and additional material may be added after settlement.

Monitoring – Alt. 3. The Dredge/Cap Hybrid Alternative would involve monitoring imported borrow material for dikes, caps, and covers; ambient air monitoring; dredge water discharge monitoring; surface water monitoring beyond the outermost engineering control structure; and coring and settlement monitoring in the cap and surcharge areas for comparison to expected settlement. Wetland vegetation surveys would also likely be required by the DNR. Details would be included in the RD/RA Plan and O&M Plan if this is the selected alternative. Ambient air and surface water quality monitoring would be conducted during all in-water construction activities and dewatering of the CAD until the MPCA allows termination of testing based on the monitoring results.

Limited groundwater monitoring may be required in portions of the SLRIDT site that are not adjacent to capped areas (see Figure 4.2.3-1, uncapped area in Stryker Bay) to assure the groundwater to surface water pathway meets all RAOs, Cleanup Levels and ARARs.

After remedial construction is complete, long-term monitoring of the BAZ for COCs will be required in capped areas (including the cap over the CAD). In addition, biota will be monitored for the potential accumulation of PAHs and possibly mercury. The caps and post-dredging environmental medium would be monitored for erosion and repaired as necessary.

Surface water monitoring would not be required after completion of this remedy because monitoring the CAD and in-situ capped sediment would detect any contaminants rising from capped sediment before release to the surface water.

Because the SLRIDT site is listed on the NPL and contamination would remain in place after completion of this remedial alternative CERCLA would require review of remedy every five years to assure it complies with RAOs, Cleanup Levels and ARARs.

Property Acquisition and Hallett Relocation – Alt. 3. Acquisition of property rights, relocation of Hallett's shipping operations, and institutional controls would be necessary to implement this alternative and maintain its protectiveness. Hallett's deep draft shipping operations at Slips 6 and 7 would be required to cease or relocate because the caps would reduce the navigational depth of Slips 6 and 7 to a point where deep draft shipping operations would no longer be possible. With armoring, Slip 7 could potentially remain available for barge traffic. Conservation easements in the riparian and wetland buffer areas would also be included as shown on Figure 4.2.3-1.

Changes to Existing Property Use – Alt. 3. The Dredge/Cap Hybrid Alternative would temporarily affect Stryker Bay landowners riparian rights during remedy implementation. This may require compensation or a dock located elsewhere. After remedy implementation Stryker Bay would be open to recreational and navigational use. The CAD in Slip 6 would render Slip 6 no longer available for recreational or maritime use. The cap in Slip 7 would reduce the navigational depth of Slip 7 to a point where deep draft shipping operations would no longer be possible. With armoring, Slip 7 could potentially remain available for barge traffic.

Conservation easements would be established along SLRIDT site shorelines (riparian buffer zones) as shown in Figure 4.2.3-1 to enhance existing and re-established habitat.

Mitigation for Public Waters and Protected Wetlands – Alt. 3. As stated in Section 3.1.1.4, the DNR has provided the MPCA with estimates of public water and wetland impacts and resultant estimates of compensatory mitigation. The DNR estimates that approximately 13 acres of on-site waters or wetlands of equal or greater public value would be needed to replace public water and wetlands functions and values lost (DNR 2003b). Detailed plans and specifications showing the post-remedy configurations would be required by the DNR to determine actual compensatory mitigation requirements (2003a).

Institutional Controls – Alt. 3. Institutional controls would be needed to assure the Dredge/Cap Hybrid Alternative isolates the contaminated material long-term and remains protective over time. The following institutional controls may be required by the MPCA for this alternative:

- Anchoring or other disturbances, temporary or permanent, may be prohibited within the footprint of the remediated areas. Anchoring restrictions would be communicated with signs on shore.

- Docks, piers, or other temporary or permanent structures could not be constructed within the footprint of the CAD or in-situ capped areas without a construction plan approved by the MPCA. In some circumstances, DNR and COE approval may also be necessary.
- Dredging would be prohibited within the SLRIDT site remediation boundaries without a dredge plan approved by the MPCA. In some circumstances, DNR and COE approval may also be necessary.
- It is assumed that there would be no institutional controls in the Wisconsin portion of the remediated area.

Implementation Schedule and Time until RAOs and Cleanup Levels are Achieved – Alt. 3. Sequencing and duration of construction of the Revised Dredge/Cap Hybrid Alternative would be refined in the design phase. Hallett' operations would have to be relocated before construction of the containment facility could begin.

Capping and surcharging of Stryker Bay would likely be conducted first. Surcharging of Stryker Bay sediments would initially create a temporary upland environment. Therefore, concerns regarding contamination of surcharge material from dredging activities would be minimal during dredging of Stryker Bay. Surcharged areas would take about two years to achieve the desired settlement followed by removal of the surcharge material.

Construction of the Slip 6 CAD would take approximately 45 days. Dredging would require 6 to 18 months or the equivalent of one and one quarter construction seasons to complete, assuming a 24 hours per day, 5 days per week dredging schedule. Hallett's operations would have to be relocated before construction of the containment facility could begin. Although construction sequencing is subject to change, total construction time is estimated to be about three years before the cap is placed on Keene Creek Bay/Slip 7 or the CAD due to prior use of the capping sand as surcharge material for Stryker Bay. Construction of this remedy would be completed in about four years, with RAOs and Cleanup Levels met in about three years in Stryker Bay and three years in Keene Creek Bay/Slip 7.

4.2.4 Alternative 4 – Dredge/Off-Site Disposal

This remedial alternative would consist of dredging, on-site dewatering and off-site disposal of all of the contaminated sediment that exceeds the Cleanup Level for TPAHs in the aquatic portions of the SLRIDT site. The areas to be dredged are shown in Figure 4.2.4-1. The eastern shoreline of Stryker Embayment would need to be stabilized to isolate the Area F Basal Tarry Layer. However, this was not included in the Companies FS. The FS Addendum estimated the in-situ contaminated sediment volumes exceeding the MPCA Cleanup Level within the aquatic portion of the SedOU to be approximately 501,000 to 609,000 cubic yards (Service 2004).

Dredging – Alt. 4. Dredging would be conducted in all contaminated aquatic portions of the SLRIDT site exceeding the MPCA Cleanup Level for TPAHs. Sediment from the entrance channel and along the dock wall of Slips 6 and 7 would be dredged to provide a 90-foot wide berth. Dredging would be conducted in the shallow areas of Slip 7 and some of its adjacent on-shore wetlands to the top of the slag layer found in this area.

Post-dredge cover material would be placed on the dredged areas described above to isolate any dredge residual and restore pre-dredge bathymetry (depth) and provide a substrate for reestablishing habitat (sediment type) that meets DNR permit requirements.

Dredge Water Management – Alt. 4. Based on the dewatering discussion in the DGR, flocculation with chemicals would be used in a dewatering impoundment on the 59th Avenue Peninsula to settle solids. Sand filtration would be used to further reduce solids to meet pre-treatment standards before discharge to the WLSSD sewer system. Backwash water would be returned to the inlet of the impoundment. With two dredges operating an additional pump lift station would likely be required to handle 500 gallons per minute flow for discharge to the WLSSD and a pipeline dedicated to access the WLSSD force main lift station. The sediment dewatering filter press would also recirculate the water back to the dewatering impoundment or to the sand filter. If the water is not disposed of at WLSSD, discharge of dredge water directly to the river would require additional treatment using a GAC System after the sand filter to meet RAOs and ARARs.

Air Emissions Control – Alt. 4. Air quality monitoring and control measures would be conducted to assure protection of public health and the environment and compliance with RAOs during remedy implementation. Response to air emissions during remedy construction would be implemented as shown in Table 3.2.4-1. Best available control technologies for air emissions would be used and may include a cover placed on the sediment receiving pond and load out stockpile areas on the 59th Avenue peninsula during dredging and dewatering operations. Additionally, dredging of areas of highest naphthalene concentrations would likely be scheduled during colder weather.

Dewatering and Disposal – Alt. 4. Active dewatering of dredged sediments would be required for this alternative to facilitate off-site transport and disposal as a solid. A pressure dewater filter press would be used to remove free liquids and reduce sediment volume for transport and disposal. The sediments would be placed in a holding pond prior to feeding into the press where they would be dewatered to about 35% solids before being trucked to an off-site disposal facility.

All dredged sediments would be pumped to the receiving pond on 59th Avenue Peninsula and processed using the dewatering methods described above. The dewatered sediments would be stockpiled in the load out area. Water removed from the sediments would be treated and discharged to the St. Louis River or WLSSD. The backwash water would be returned to the receiving pond for additional filtration. Based on current information, it is not expected that the dewatered sediments would be considered hazardous wastes. Assuming that they are not hazardous wastes, the dewatered sediments would be trucked off-site to a permitted solid waste landfill. If the dewatered wastes were to be determined to be hazardous wastes, management at an off-site permitted hazardous waste treatment or disposal facility would be required.

Monitoring – Alt. 4. This alternative would involve monitoring imported borrow material for covers, ambient air monitoring, dredge water discharge monitoring, and surface water monitoring beyond the outermost engineering control structure. Wetland vegetation surveys would also likely be required by the DNR. Details would be included in the RD/RA Plan if this is the selected alternative. Ambient air and surface water quality monitoring would be conducted during in-water construction activities and dewatering until the MPCA allows termination of testing based on the monitoring results.

Limited groundwater monitoring may be required in portions of the SLRIDT site where there is discharge of groundwater from contaminated upland areas to assure that the groundwater/surface water pathway meets all RAOs and Cleanup Levels. Surface water monitoring would not be required after placement of the post-dredging cover.

After remedial construction is complete, the post-dredging cover and environmental medium would be monitored for erosion and repaired as necessary. This monitoring would be conducted until the data demonstrate that all sediment risks have been satisfactorily managed.

Because the SLRIDT site is listed on the NPL and because Alternative 4 does not address the Basal Tarry Unit would remain after completion of this remedial alternative the Federal Superfund law would require review of remedy every five years to assure it complies with RAOs, Cleanup Levels and ARARs

Property Acquisition and Hallett Relocation – Alt. 4. Relocation of Hallett's deep draft shipping operation would not be required under Alternative 4 since the post-dredge conditions of the slips would meet the 25-foot depth preference for loading deep draft vessels and dredging would be managed around Hallett's shipping schedules. Conservation easements in the riparian and wetland buffer areas would also be included as shown on Figure 4.2.3-1. The conservation easements may include the possible purchase of title but no property acquisition would be required for this alternative.

Changes to Existing Land Use – Alt. 4. The Dredge/Off-Site Disposal Alternative would temporarily affect Stryker Bay landowners' riparian rights and Hallett Dock Slip 6 and Slip 7 operations during remedy implementation. This may require compensation or a dock located elsewhere.

Conservation easements would be established along SLRIDT site shorelines (riparian buffer zones) as shown in Figure 4.2.4-1 to enhance existing and re-established habitat.

Mitigation for Public Waters and Protected Wetlands – Alt. 4. As stated in Section 3.1.1.4, the DNR has provided the MPCA with estimates of public water and wetland impacts and resultant estimates of compensatory mitigation. Mitigation for Alternative 4 includes the replacement of suitable substrate and aquatic habitat restoration. Detailed plans and specifications showing the post-remedy configurations would be required by the DNR to determine actual compensatory mitigation requirements (DNR 2003a).

Institutional Controls – Alt. 4. Institutional controls will be needed to assure the Dredge/Off-Site Disposal Alternative isolates the contaminated residue long-term and remains protective over time. The following institutional controls may be required by the MPCA for this alternative:

- Dredging would be prohibited within the SLRIDT site remediation boundaries without an MPCA approved dredge plan.

Implementation Schedule and Time until RAOs and Cleanup Levels are Achieved – Alt. 4. It will take about two months to mobilize and construct the dewatering and water treatment system. Dredging would be completed within approximately two to three years, if two mechanical

dredges are used and would operate at the same time in different areas of the SLRIDT site 24 hours per day, 5 days per week during a 7-month construction season. While such dual dredging may increase the level of the ambient naphthalene emissions, it can reduce the duration of the emissions by half. Post dredge capping and armoring would take about three to four months to complete and would start in each area (i.e. Stryker Bay, Slip 6 and Slip 7) upon completion of the dredging. The remedy will take about three years to complete and would meet RAOs and Cleanup Levels after the post-dredge cover is completed. Sequencing and duration of this alternative would be refined in the RD/RA Plan should this alternative be selected.

4.3 Treatability Studies

Under the RFRAs issued for the SedOU by the MPCA, the Companies were required to conduct treatability studies designed to test the effectiveness and reliability of remediation technologies that are part of the remedy alternatives considered for the SLRIDT site (RFRAs, Exhibit A, Part 3.F.1.) Previous reports submitted by the Companies describe a wide range of treatability studies that have been undertaken in the process of refining remedial alternatives. These studies include, but are not limited to those studies listed below.

- Draft Alternatives Screening Report, Appendix B1, Final Report on Biodegradation, 1997. (IT 1997b)
- Draft Alternatives Screening Report, Treatment Study and Appendix B2, Report of Sediment Treatability, 1997. (IT 1997b)
- Draft Feasibility Study, Appendix A, Elutriate Toxicity Testing, 1998. (IT 1998)
- Draft Feasibility Study, Appendix B, Report of Sediment and Dredge Water Treatability, 1998. (IT 1998)
- Draft Feasibility Study, Appendix C, Mechanical Dewatering Studies, 1998. (IT 1998)
- Dredge Water Treatability Test Study Results, 1999. (SERVICE 1999)
- Data Gap Report as Approved and Amended with Modifications on January 14, 2004 (SERVICE 2002) and the February 6, 2003 Peer Review team Comments (PRT 2003).

5.0 REMEDY SELECTION CRITERIA AND DETAILED ANALYSIS OF RESPONSE ACTION ALTERNATIVES

This section presents the criteria used by MPCA to select a remedy for the SedOU and presents the MPCA's evaluation of each of the four remedy alternatives based upon those criteria. The four remedy alternatives addressed by the FS and considered by the MPCA were described in Section 4.0.

5.1 Remedy Selection Criteria

The RFRAs issued for the SedOU by the MPCA provide the criteria that MPCA uses to select a remedy for the SedOU (RFRAs, Exhibit A, Part IV.C). The remedy selection criteria are divided into three categories: the threshold criterion, balancing criteria, and community acceptance. The remedy selection criteria are described in detail below.

5.1.1 Threshold Criterion

To be selected by the MPCA, a remedy alternative must meet the threshold criterion of providing overall protection for the public health and welfare and the environment. This criterion is met if the alternative will achieve the RAOs and Cleanup Levels identified in Section 3.0 or if the alternative provides for a remedy that is "permanent" as defined by the RFRAs. Although all of the remedy alternatives evaluated in the FS provide for long-term protection of public health and welfare and the environmental and thus may be considered permanent as that term is used in the definition of a remedy under MERLA, the term "permanent" is defined differently and more narrowly under the RFRAs. A "permanent" remedy under the RFRAs is one that allows for unrestricted use of the Site and associated natural resources, does not involve off-site removal of contaminants, and minimizes exchange of contaminants to other environmental media. None of the alternatives addressed in the FS meets the RFRA definition of a permanent remedy. Therefore, the threshold criterion that must be met under the RFRAs is that the selected remedy alternative will achieve the RAOs and Cleanup Levels identified in Section 3.0. MPCA considers compliance with ARARs identified in Section 3.0 to be part of the threshold criterion because RAOs and Cleanup Levels are based on ARARs and because the RFRAs require that any remedy selected by the MPCA be in compliance with ARARs.

5.1.2 Balancing Criteria

Alternatives that meet the threshold criterion of overall protection of public health and welfare, and the environment are further evaluated using the Balancing Criteria listed below. Under the RFRAs, the evaluated Alternative that provides the best balance among the Balancing Criteria in consideration of the Site-specific circumstances is the remedy to be selected by the MPCA (RFRAs, Exhibit A, Part IV.C.2). The Balancing Criteria are listed in order of priority with long-term effectiveness being most important.

Long-term Effectiveness. Long-term effectiveness is the ability of an alternative to maintain the desired level of protection of public health and welfare, and the environment over time. Permanent remedies, as defined by the RFRAs, provide absolute long-term effectiveness. In the event a permanent remedy is not feasible, alternatives that significantly alter the hazardous substances or pollutants or contaminants to produce significant reductions in toxicity, mobility,

or volume through treatment will be preferred. In addition, the ability of the alternative to obtain and/or manage treatment residuals, minimize transfer of contaminants to another environmental media, and maintain established RAOs and Cleanup Levels over time shall be a major consideration.

Implementability. The technical and administrative feasibility of implementing the alternative and the availability of goods and services needed to implement the alternative shall be considered.

Short-term Risks. The short-term risks that may be posed as a result of implementing an alternative shall be considered and weighted against the ultimate long-term benefits of implementing that alternative.

Total Costs. The complete cost breakdown of implementation of the alternative including the projected costs of any long-term monitoring, O&M, and response action dismantling shall be considered. The future costs to replace the alternative or respond to a future release shall also be considered in this evaluation.

5.1.3 Community Acceptance

The RFRAs require MPCA to determine the degree of community acceptance for each remedy alternative.

The community shall be consulted regularly in regard to the response action alternatives available for remediation at the SLRIDT site. Efforts will be made to inform the community about the hazards of the SLRIDT site and the advantages and disadvantages of various approaches to remediation and to gain an understanding of the concerns and preferences of the community with regard to the remedy selected for the SLRIDT site. The community's concerns and response action preferences will be considered when the MPCA selects the remedy.

Section 1.3.5 describes in detail the community and stakeholder process developed for the SLRIDT site.

5.2 Detailed Analysis of Alternatives

This section evaluates the four alternatives described in Section 4 against the criteria presented in Section 5.1.

5.2.1 Alternative 1 - No Further Action

As a baseline for comparison, the No Action Alternative is evaluated at every Superfund site. Under the No Action Alternative, no response actions are taken to address existing SLRIDT site conditions. The No Action Alternative does not include any treatment, engineering controls, or institutional controls. This alternative does not include long-term groundwater monitoring. All existing monitoring wells for the No Action Alternative would be abandoned.

5.2.1.1 Threshold Criterion

Based on the determinations in Sections 2.3 and 2.4 regarding human health and ecological risks posed by the sediment contamination at the SLRIDT site a No Action Alternative which does not address these risks would not be protective of public health and welfare and the environment. Because it does not meet the threshold criterion, the No Action Alternative was not carried forward for analysis under the other remedy selection criteria.

5.2.2 Alternative 2 – In-Situ Cap

This alternative would consist primarily of capping contaminated sediments in-situ with clean material and institutional controls. In-situ capping would be conducted in Stryker Bay, Slip 6, and Keene Creek Bay/Slip 7, and portions of the on-shore wetlands in Keene Creek Bay/Slip 7. Contaminated sediments located within the Federal navigation channel near the 48-inch outfall would be dredged. WDNR would also require dredging in the portion of the SLRIDT site located in Wisconsin. This dredged material would be placed in Slip 6 and capped; it would not be placed in a confined aquatic facility. The components of Alternative 2 are described in greater detail in Section 4.2.2 and are shown on Figure 4.2.2-1.

5.2.2.1 Threshold Criterion

MPCA believes that capping of contaminated sediments when implemented in accordance with the RAOs and Cleanup Levels in Section 3.0 can provide long-term protection of public health and welfare and the environment through isolation of the contaminated sediment. After installation of the in-situ cap, the contaminated sediments would remain in place, be inaccessible to humans and would be isolated below the BAZ. Groundwater which may be transported through the sediment and into the isolation zone of the cap or into the BAZ has been modeled and is predicted to meet RAOs, Cleanup Levels and ARARs for protection of the organisms living in the BAZ, as well as for the aquatic community in the water column above the cap, and for human consumption of fish.

The In Situ Cap Alternative would meet the MPCA's RAOs and Cleanup Levels, and comply with ARARs with the exception of the DNR public waters permit requirements and WCA requirements. As stated by the DNR, "Stryker Bay is a unique, existing shallow sheltered bay with variable water depths, including a maximum depth greater than 5 feet deep. The *In Situ* capping will eliminate and adversely affect the functions and values of this unique bay by significantly reducing water depths and elimination of wetlands and public waters. Therefore, In Situ capping does not 'establish' a shallow sheltered bay in Stryker Bay; it adversely affects an existing sheltered bay condition." The DNR concluded that it is unlikely that the In Situ capping will comply with DNR and WCA ARARs" because "the DNR would likely not be able to issue a public waters work permit for the In-Situ Cap Alternative" (DNR 2003a). See Section 3.0 which identifies the ARARs applicable to the remedy alternatives.

The DNR public waters permit is a critical requirement that must be met for the successful implementation of any remedy for the SedOU, since any remedy will involve dredging and/or filling of public waters. DNR's doubt about the permittability of Alternative 2 appears to be well founded and raises a serious concern for MPCA about whether Alternative 2 is likely to meet the threshold remedy selection criterion. While the MPCA believes it is reasonable to consider this

concern in reaching its decision on the selected remedy for the SedOU, the MPCA also believes it will be helpful in reaching that decision to complete the evaluation of Alternative 2 against the remaining remedy selection criteria.

5.2.2.2 Balancing Criteria

Long-term Effectiveness. The In-Situ Cap Alternative is expected to be effective in the long-term. The contaminated sediments would be isolated from the BAZ and surface water by the cap material. The contaminated sediments are underlain by a site-wide, 50-foot-thick, silt and clay confining layer, which would prevent downward migration of the contaminants to the regional aquifer. Modeling of contaminant transport upward into the In-Situ cap predicts that the cap would be effective in preventing contaminants from exceeding RAOs and Cleanup Levels in the BAZ and surface water in the long-term (SERVICE 2002; Appendix GW2). With proper long-term O&M, monitoring, and contingency action, this remedy would continue to meet RAOs, and Cleanup Levels over time.

Conservation easements would be established along SLRIDT site shorelines (riparian buffer zones) as shown in Figure 4.2.2-1 to enhance existing and re-established habitat to help assure long-term effectiveness of the remedy.

The In-Situ Cap Alternative would not reduce the toxicity, mobility or volume of contaminants through treatment. Alternative 2 would minimize transfer of contaminants from sediments to other environmental media.

Implementability. The In-Situ Cap Alternative would be technically implementable. Capping is feasible from an engineering standpoint and it has been successfully implemented at other sites with similar characteristics and could be implemented at this Site, including in shallow water over soft sediments. Cap material is readily available in the area from commercial sand operations, the harbor's CDF (Erie Pier), or possibly delivered directly from other navigational dredging projects. Erie Pier sand and washed sand from a commercial operation (Omar Sand) were demonstrated to be suitable during bench scale cap testing (SERVICE 2002; Appendix BT).

Environmental and physical monitoring of the in-situ cap could be accomplished using a combination of techniques including settlement plates, bathymetric surveys, invasive species monitoring, visual inspection, sampling (coring) of sediments and capping material for both physical and chemical analysis, and collection of surface water and air samples.

The DNR has expressed doubt about the permittability of Alternative 2, but has indicated that, if it could issue a public waters permit, approximately 52 acres (1:1 replacement ratio) of "on-site" and "in-kind" replacement would be necessary in order to restore impaired use. Off-site mitigation, within the estuary would require a 2:1 replacement ratio. Off-site mitigation, outside of the estuary would require an even greater replacement ratio (DNR 2003b). Such large mitigation opportunities would be difficult to find within the estuary, and could be extremely costly if located outside the estuary. Doubts about the permittability of Alternative 2, and the ability to provide adequate mitigation if it were permittable, raises serious uncertainty about the administrative implementability of this alternative.

Short-term Risks. Minimal odor or air emission risks are predicted from capping activities. On-Site workers would not be expected to be exposed to any adverse short-term chemical risks from cap installation activities. Potential short-term risks to humans also include risks associated with truck traffic, including air borne particulate emissions, if capping material is hauled by truck.

Short-term adverse effects during construction of the cap would include displacement of fish, removal and/or smothering of aquatic vegetation and benthic organisms, negative impacts to the water column due to increased turbidity from suspended solids, and potential temporary release of higher levels of contaminants and nutrients. Aquatic vegetation and benthic organisms are expected to be re-established in capped areas within several growing seasons once replacement substrate is placed. However, capping will alter the types of waters and wetlands that will be present in Stryker Bay after remedy construction, which will affect the types of habitat that will be re-established. No significant adverse short-term risks to aquatic habitat and biota outside of the treatment/work zone are anticipated.

Total Costs. The estimate of costs developed by the Companies indicates a cost for this alternative of approximately $31.7 to $42 million. The cost range reflects the potential range of mitigation cost estimates provided by the DNR. The costs for financial assurance, compensation for loss of riparian use, and long-term O&M, monitoring, and contingency action required by the MPCA have not been taken into account in the Companies cost estimate. These costs cannot be accurately estimated by the MPCA at this time. However, they will add to the total cost of this alternative. A detailed cost breakdown of the estimated costs developed by the Companies is summarized in the FS.

5.2.2.3 Community Acceptance

Based on the comments received by the MPCA during the RI/FS process and the public comment period on the Proposed Plan, there was minimal community support for a total capping remedy. The major comments on capping include the loss of existing natural resources, the loss of riparian use for property owners in the Stryker Bay area, and loss of the deep draft shipping operations from Slips 6 and 7. Additional comments include concern with leaving the contamination in the water, long term protection of public health and the environment and financial assurances in the event that the remedy fails. O&M, monitoring, and contingency action plans, and financial assurance would be added to this Alternative in response the comments received. Additional details would be provided in this ROD and the approved RD/RA Plan and O&M Plan if this remedy is selected.

5.2.3 Alternative 3 – Revised Dredge/Cap Hybrid

Alternative 3 consists of a combination of environmental dredging, in-situ capping, and dredged sediment containment and institutional controls. The components of Alternative 3 are illustrated in Figure 4.2.3-1 and described in detail in Section 4.2.3.

5.2.3.1 Threshold Criterion

The Revised Dredge/Cap Hybrid Alternative would be protective of public health and welfare, and the environment through a combination of mass removal of contaminated sediment in Stryker Bay by dredging, isolation of the dredged contaminated sediment by containment, and

in-situ capping, including capping with surcharging, and institutional controls. Taken together, these elements would prevent, control, and minimize exposure of contaminants to humans and the environment. The contaminated sediment would not be accessible to human contact below a post-dredge cover, within the CAD or under a cap. The Revised Dredge/Cap Hybrid Alternative would meet the MPCA's RAOs and Cleanup Levels, and comply with all ARARs, including DNR public waters permit requirements. Because Alternative 3 results in the restoration of depths and other natural resource functions in Stryker Bay in a manner that preserves its unique values as a shallow sheltered Bay in the St. Louis River Estuary, Alternative 3 is considered to be permittable by DNR.

5.2.3.2 Balancing Criteria

Long-Term Effectiveness. The Revised Dredge/Cap Hybrid Alternative would be effective in the long-term, with mass removal of contaminants from the dredged portions of Stryker Bay and the federal navigation channel, and appropriate monitoring, O&M, and contingency action for the in-situ caps and CAD. Contaminated sediment removed by dredging would be consolidated and isolated in an on-site containment facility. Any contaminated dredge residual remaining after dredging would be isolated by a post-dredging cover to protect public health and welfare, and the environment and restore water depth and habitat substrate.

In areas where capping is used, contaminated sediments would be isolated from the BAZ and surface water by the cap material. The contaminated sediments are underlain by a site-wide, 50-foot-thick, silt and clay confining layer, which would prevent downward migration of the contaminants to the regional aquifer. Modeling of contaminant transport upward into the cap predicts that the cap would be effective in preventing contaminants from exceeding RAOs and Cleanup Levels in the BAZ and surface water in the long-term (SERVICE 2002; Appendix GW2). With proper long-term O&M, monitoring, and contingency action this remedy would continue to meet RAOS, Cleanup Levels and ARARs over time.

Conservation easements would be established along SLRIDT site shorelines (riparian buffer zones) as shown in Figure 4.2.3-1 to enhance existing and re-established habitat to help assure long-term effectiveness of the remedy.

This Alternative would reduce the volume of contaminants contained within the CAD through treatment of the water associated with the dredged sediment prior to disposal or discharge. In areas where sediment is capped or deposited in the CAD, this Alternative would minimize transfer of contaminants from sediments to other environmental media.

Implementability. The Revised Dredge/Cap Hybrid Alternative would be implementable both technically and administratively. Environmental dredging, in-situ capping, containment, and application of post-dredge cover are feasible from an engineering standpoint, have been successfully implemented at other similar contaminated sites, and could be implemented at the SLRIDT site. Equipment and qualified contractors are available to perform these activities.

Environmental and physical monitoring of the caps and containment facility would be accomplished using a combination of techniques, including settlement plates, bathymetric surveys, invasive species monitoring, visual inspection, sampling (coring) of sediments and capping material for both physical and chemical analysis, and collection of surface water and air

samples. Best management practices such as floating covers and sequenced dredging would be used if necessary to reduce the potential emissions of naphthalene during dredging and dewatering activities.

It would be administratively implementable, including permittable by the DNR. Depending on design-level analyses of post-remediation configurations DNR estimates up to approximately 13 acres (1:1 replacement ratio) of "on-site" and "in-kind" replacement would be necessary in order to restore impaired use or functions of waters or wetlands. Off-site, within the estuary would require a 2:1 replacement ration. Off-site, outside of the estuary would require a greater replacement ratio as part of the work in public waters permit process (DNR 2003b).

Short-Term Risks. The potential for short-term air quality risks associated with the Revised Dredge/Cap Hybrid Alternative are predicted to be minimal because areas of highest naphthalene concentrations would be capped rather than dredged, and because dredged material would be deposited in a CAD approximately 2,500 feet from residents. Air monitoring would be conducted during all in-water construction activities and dredge water treatment and response activities will be required if levels of naphthalene emissions meet trigger levels set in the RAOs for the remedy (see Table 3.2.4-1). On-Site workers would be required to wear appropriate personal protection equipment, including air-purifying respirators when so specified in the safety program.

Potential short-term risks to humans also include risks associated with truck traffic if capping material is hauled by truck.

Short-term adverse ecological effects during implementation of capping and dredging would include displacement of fish, removal and/or smothering of aquatic vegetation and benthic organisms, negative impacts to the water column due to increased turbidity from suspended solids, and temporary release of higher levels of contaminants and nutrients. Aquatic vegetation and benthic organisms are expected to be re-established within several growing seasons once replacement substrate is placed. No significant adverse short-term risks to aquatic habitat and biota outside of the treatment/work zone are anticipated.

Total/Present Value Cost. The estimate of costs developed by the Companies indicates that this alternative would cost approximately $43.8 to $48.2 million. The cost range reflects the potential range of mitigation cost estimates provided by the DNR. The costs for financial assurance, compensation for loss of riparian use, and long-term O&M, monitoring and contingency action required by the MPCA have not been taken into account in the Companies cost estimate. These costs cannot be accurately estimated by the MPCA at this time. However, they will add to the total cost of this Alternative. A detailed cost breakdown of the estimated costs developed by the Companies is summarized in the FS.

5.2.3.3 Community Acceptance

Based on the comments received by the MPCA during the RI/FS process and the public comment period on the Proposed Plan there was in general high support for Alternative 3. Reasons cited for support of Alternative 3 included maintaining natural resources and maintaining riparian use for property owners in the Stryker Bay and Slip 7.

Comments on Alternative 3 include concern about the loss of the currently limited deep draft shipping operations from Slips 6 and 7, leaving the contamination in the water, not removing the highest concentrations of contaminants in Stryker Bay, and long term protection of public health and the environment and financial assurances in the event that the remedy fails. Based on these comments, the MPCA has developed the following responses and/or modifications to Alternative 3 (described in Section 4.2.3):

- Boat Slips 6 and 7 are already unable to handle deep-draft vessels. The COE maintains the shipping channel at a depth of 23 feet, 4 feet shy of the minimum maintained in other parts of the port's network. Therefore, in terms of waterborne commerce the Site is not accessible by fully loaded deep-draft ships. Ships currently using Slips 6 and 7 can only be partially filled or unloaded in those slips, with the remaining portion of the load handled elsewhere in the port. Boat Slip 6 will continue to be an aquatic environment but may not be open to recreational use. Boat Slip 7 and Keene Creek bay will continue to be an aquatic environment that will be open to recreation use. However, deep-draft vessels will no longer be able to use either Slip 6 or Slip 7. One potential option to maintain the current capability of Dock 6 or 7 would be to create a dock face parallel to the navigation channel. Barge traffic may also be possible in Slip 7 with additional armoring of the cap. These modifications are not part of the Alternative 3 but could be completed by existing and future land owners that are interested in upgrading the facility. Any modifications or upgrades to the completed remedy would require MPCA approval.
- The MPCA requested Bay West Inc. (Bay West) to review the FS to determine if Slip 6 could accommodate all of the contaminated sediments in Stryker Bay, including the most heavily contaminated sediments, and to determine the cost associated with this modification to Alternative 3. This analysis is included in Appendix 1, as Attachment C to the Responsiveness Summary. Bay West concluded that, if dredged contaminated sediments were limited to the minimum estimated volumes in the FS, this amount would likely fit into Slip 6. However, if dredged contaminated sediments reached the maximum estimated volumes, all of the hot spot areas would require off-site disposal. The estimated cost range for a modified Alternative 3 would be $55.2 million to $56.8 million. This is approximately $8.6 million greater than the high end range of Alternative 3. A modified Alternative 3 would not provide greater long-term protectiveness of public health, welfare or the environment than the current Alternative 3, but would cost substantially more. In addition, a modified Alternative 3 would pose greater risk of exceeding human health based RAOs for air emissions. Finally, to the extent a modified Alternative 3 would involve off-site transportation and disposal of contaminated sediments, it is doubtful that MPCA could make the determination required to select such a remedy under MERLA. Therefore, Alternative 3 was not modified to include hot spot removal.
- O&M, monitoring, contingency action plans, and financial assurance would be added to this Alternative in response the comments received. Additional details would be provided in this ROD and the approved RD/RA Plan and O&M Plan if this remedy is selected.

5.2.4 Alternative 4 – Dredge/Off-Site Disposal

Alternative 4 consists of dredging of all contaminated sediment at the SLRIDT site, on-site dewatering and off-site disposal of the dredged contaminated sediment. The components of Alternative 4 are described in greater detail in Section 4.2.4 and shown in Figure 4.2.4-1.

5.2.4.1 Threshold Criterion

This alternative would be protective against long-term unacceptable risks to public health and the environment through mass removal of the contaminated sediment from the SLRIDT site, placement of the dredged material in an approved off-site disposal facility, and application of a post-dredge cover to isolate contaminated post-dredge residue. The contaminated sediment would not be accessible to human or ecological contact below a post-dredge cover or within a permitted landfill. Alternative 4 would meet the MPCA's RAOs and Cleanup Levels, and comply with ARARs introduced in Section 3.0.

5.2.4.2 Balancing Criteria

Long-term Effectiveness. Long-term effectiveness of this remedy at the SLRIDT site is attained by mass removal and, where residual contaminants remain, by application and maintenance of a post-dredge cover to protect potential receptors by immobilization, dilution, and isolation of the residual. Because most of the mass of PAHs would be removed, a long-term monitoring and maintenance program for dredged areas would not be required. Any residual contaminants remaining after dredging would be isolated by a post-dredging cover to protect public health and welfare, and the environment and restore water depth and habitat. The off-site portion of this Alternative would be effective in the long-term, with use of a properly permitted and operated off-site landfill to dispose of the dredged material.

Conservation easements would be established along SLRIDT site shorelines (riparian buffer zones) as shown in Figure 4.2.4-1 to enhance existing and re-established habitat to assure long-term effectiveness of the remedy.

This alternative would reduce the volume of contaminants subject to off-site disposal through actively dewatering the dredged sediment and treating the water prior to off-site disposal.

Implementability. The Dredge/Off-Site Alternative would be technically implementable. Environmental dredging, landfilling, and application of post-dredge cover are feasible from an engineering standpoint and have been successfully implemented at other similar contaminated sites and could be implemented at the SLRIDT site. Debris in the sediment could potentially interfere with the productivity of the dredging operation increasing the duration of the remedial action. Dredging equipment and qualified contractors are available to perform the dredging required for this alternative.

Environmental and physical monitoring of the caps and containment facility would be accomplished using a combination of techniques, including settlement plates, bathymetric surveys, invasive species monitoring, visual inspection, coring to obtain samples of sediments and capping material for both physical and chemical analysis, and collection of surface water and air samples. Best management practices such as floating covers and sequenced dredging would be used to the extent possible to reduce the potential emissions of naphthalene during dredging and dewatering activities.

This alternative would also be administratively implementable. The DNR has indicated this alternative would not require compensatory mitigation.

Short-term Risks. Based on air emission modeling, the Dredge/Off-Site Disposal Alternative may produce temporary emissions above the RAOs and Cleanup Levels during dredging and containment of sediments, most likely when dredging and handling sediments from the areas of highest naphthalene concentrations. Air monitoring would be conducted during all in-water construction activities and dredge water treatment and response activities will be required if levels of naphthalene emissions meet trigger levels set in the RAOs for the remedy (see Table 3.2.4-1). On-site workers would be required to wear appropriate PPE, including air-purifying respirators when so specified in the safety program.

Potential short-term risks to humans also include risks associated with truck traffic if dredged and cap material is hauled by truck.

Modeling indicates dredging of the areas of highest PAH concentrations may also cause temporary surface water quality impacts above chronic standards, but not above FAVs at the designated discharge point of compliance. Treatment/work areas would be contained with engineering control structures. Adverse effects to aquatic habitat and biota in the treatment/work zones include displacement and injury of fish, removal of aquatic vegetation and benthic organisms, negative impacts to the water column due to increased turbidity by suspended solids, and increased release of contaminants and nutrients. Aquatic vegetation and benthic organisms are expected to be re-established within several growing seasons once replacement substrate is placed. No significant adverse short-term risks to aquatic habitat and biota outside of the treatment/work zone are anticipated.

Total/Present Value Cost. The estimate of costs developed by the Companies indicates that this alternative would cost approximately $94.9 to $110.7 million. The costs for long-term O&M, and monitoring required by the MPCA have not been taken into account in the Companies cost estimate. However, they will add to the total cost of this Alternative. A detailed cost breakdown of the estimated costs developed by the Companies is summarized the in FS.

5.2.4.3 Community Acceptance

Based on the comments received by the MPCA during the RI/FS process and the public comment period, in general, there was moderate to high support for Alternative 4. Support for Alternative 4 included maintaining natural resources and maintaining riparian use for property owners including maritime use.

Comments to Alternative 4 include the inflated cost and potential increased short-term risks to public health and the environment. Based on these comments, the MPCA has developed the following responses and/or modifications to Alternative 4 (described in Section 4.2.4):

- The cost estimates were reviewed by the PRT and modified by the Companies accordingly. In addition, in response to the comments received, the MPCA requested Bay West to review the costs to determine if they were inflated. This analysis is included as Attachment C to the Responsiveness Summary, Appendix 1. Bay West concluded that the level of effort detailed in the cost estimate appears to be reasonable and does not appear to include any unnecessary processes. While many comments favored Alternative 4, this alternative was estimated at twice the estimated cost of other alternatives.
- Monitoring and O&M plans would be added to this Alternative in response the comments received. Monitoring during remediation and mitigation plans would be developed to assure

protection of public health and the environment during remediation. Additional details would be provided in this ROD and the approved RD/RA Plan and O&M Plan if this remedy is selected.

6.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

The purpose of the comparative analysis is to identify and compare advantages and disadvantages of each evaluated alternative relative to one another with respect to remedy selection criteria in the RFRAs in order to determine which of the alternatives best meets those criteria. The comparative analysis is documented in this section and summarized in Section 6.4.

6.1 Threshold Criterion

Only those Alternatives that met the Threshold Criterion of providing overall protection for the public health and welfare, and the environment were evaluated under the Balancing Criteria and are carried forward for comparative analysis in this section. Therefore, Alternative 1, No Action, was not carried forward because it did not achieve the Threshold Criterion. There is substantial doubt that Alternative 2, the In-Situ Cap Alternative would meet the Threshold Criterion because this alternative would likely not meet DNR's requirements for issuance of a public waters permit. However, Alternative 2 was carried forward for further evaluation while recognizing this uncertainty. Alternative 3, the Dredge/Cap Hybrid Alternative, and Alternative 4, the Dredge/Off Site Disposal Alternative, achieve the Threshold Criterion.

6.2 Balancing Criteria

Under the RFRAs issued by MPCA for the SedOU, MPCA is directed to select the alternative remedy that meets the threshold criterion and provides the best balance among the balancing criteria in consideration of the site-specific circumstances (RFRAs, Exhibit A, Part IV.C.2). The Balancing Criteria are listed in order of priority below with long-term effectiveness being most important.

6.2.1 Long-term Effectiveness

Long term effectiveness is the ability of a remedy to maintain the desired level of protection of public health and welfare and the environment over time. A "permanent" remedy as defined by the RFRAs provides the ultimate in long-term effectiveness. As explained in Section 5.1.1, none of the three alternatives considered for the SedOU is "permanent" under the RFRA definition. Where remedy alternatives are not "permanent," long-term effectiveness under the RFRAs is judged by whether the remedy significantly reduces toxicity, mobility or volume of contaminants through treatment.

Treatment of contaminants to reduce toxicity, mobility or volume is not a major component of any of the evaluated alternatives. Alternative 3 provides some treatment that reduces the volume of contaminants required to be managed in the CAD through the treatment of dredge water. Alternative 4 provides some treatment that reduces the volume of contaminants to be managed in an off-site landfill through the treatment of the water produced by dredge dewatering. The treatment included in these alternatives does not provide a strong basis for considering one alternative preferable to another under long-term protectiveness.

The other major consideration in assessing long-term effectiveness under the RFRAs is the ability of the remedy to manage treatment residuals, minimize transfer of contaminants to other media, and maintain RAOs and Cleanup Levels over time.

Given the low level of treatment involved in the evaluated alternatives, management of treatment residuals is not considered a major factor in assessing their long-term effectiveness.

Both Alternatives 2 and 3 minimize the transfer of contaminants to other media. At the end of remedy construction, most of the contaminants will remain in the sediments but will be effectively isolated from exposure to minimize risks to human health and the environment. Some transfer of contaminants to surface water within the treatment/work zones will occur during remedy construction for both Alternatives 2 and 3. In addition, Alternative 3 will involve some transfer of contaminants to the air during dredging and CAD construction, but the sediments dredged in Alternative 3 will not have high concentrations of naphthalene, so transfer to the air would be less than Alternative 4 but more than Alterative 2. Alternative 4, by contrast, dredges all contaminated sediment from the Site and transfers them to the land at a permitted off-site disposal facility. All three alternatives would transfer some contaminants to the surface water within the treatment/work zones during remedy construction. Alternatives 3 and 4 would transfer some contaminants to the air during dredging of sediments. Comparatively, Alternative 4 would likely transfers substantially more contaminants to surface water within the treatment/work zones during remedy construction, and may involve a significant amount of transfer of contaminants to the air during dredging of sediments with highest naphthalene concentration.

All three alternatives are expected to be able to maintain compliance with RAOs and Cleanup Levels over time. In achieving this, all of the alternatives rely to large extent on long-term monitoring, O&M, and contingency action. However, once the remedy is constructed, Alternative 4 does not require substantial activity of this sort at the Site because all of the contaminants, except for any post-dredge residual, will have been dredged and transported off-site for disposal in a permitted landfill. Alternative 4 relies on the proper operation, maintenance and post-closure care provided at the landfill for long-term protectiveness off-site. Alternatives 2 and 3 rely heavily on long-term monitoring, O&M and contingency action to maintain on-site compliance with RAOs and Cleanup Levels over time. MPCA expects that the effectiveness of the caps and CAD in meeting RAOs and Cleanup Levels over time, when constructed in accordance with RAOs set in Section 3, will be comparable to effectiveness of a permitted landfill.

Although not specifically addressed under long-term effectiveness in the RFRAs, compliance with ARARs is a reasonable consideration where the ARARs affect long-term protection of public health or welfare or the environment. The DNR public waters permit, one of the ARARs identified in Section 3, will affect the long-term conditions of the water bodies and habitat in the SedOU after remediation. Both Alternatives 3 and 4 are expected to be permittable by DNR. Both provide for long-term restoration of shallow sheltered bay conditions in Stryker Bay, and do not require substantial additional public waters mitigation. DNR has expressed doubt about its ability to permit Alternative 2, which permanently alters or eliminates shallow sheltered bay conditions of Stryker Bay and would require substantial public waters mitigation.

Overall, MPCA concludes that Alternatives 3 and 4 provide a comparable high degree of long-term effectiveness, with the main difference being that Alternative 4 relies on off-site, land containment, while Alternative 3 relies on in-situ and on-site containment in a CAD. Alternative 2 provides a somewhat lower degree of long-term protectiveness than the other alternatives,

especially with regard to the long-term environmental protection and preservation of Stryker Bay. Transfer of contaminants to other media is also a concern with regard to the long-term effectiveness of Alternative 4. This concern is also reflected in the short term risk comparison below, and in the MERLA determination that is required for any remedy alternative that involves off-site transport and disposal of contaminants (see Section 3.3.4).

6.2.2 Implementability

Dredging, capping, and containment as well as the O&M and monitoring that would be required for Alternatives 2, 3, and 4, are technologies, that are feasible from an engineering perspective, and could be readily implemented at the SLRIDT site. Therefore these alternatives are technically implementable. All of these technologies have been implemented successfully at other sediment contamination sites with circumstances that are similar to the SedOU at the SLRIDT Site.

Implementability also includes administrative implementability of the remedy. The DNR has indicated that permanent loss of the shallow sheltered bay conditions in Stryker Bay that would result from the implementation of Alternative 2 would make it problematic for DNR to issue a public waters permit for this alternative when there are other feasible alternatives that could be implemented, including Alternative 3. In addition, finding adequate mitigation opportunities for losses posed by the In-Situ Cap Alternative would be difficult within the estuary. The DNR has provided the following preliminary estimates for additional mitigation that may be required for issuance of a public waters permit for each alternative. These estimates are subject to refinement during the design and permitting processes:

Table 6.2.2-1 DNR Preliminary Mitigation Estimates

Alternative	Estimated Public Waters Mitigation (Acres)
Alternative 1: No Further Action	Not Evaluated
Alternative 2: In-Situ Cap	52 (on-site, in-kind – greater if off-site)
Alternative 3: Dredge/Cap Hybrid	13 (on-site, in-kind – greater if off-site)
Alternative 4: Dredge/Off-Site Disposal	Replacement of suitable substrate and aquatic habitat restoration

DNR generally expects that mitigation provided within the SLRIDT site would be at a one to one ratio, while mitigation off-Site but within the St. Louis River estuary would be at a two to one ratio. Mitigation outside the estuary will require a significantly higher ratio than two to one. For these reasons, Alternative 2 would not likely be administratively implementable.

6.2.3 Short-term Risks

All alternatives would have short-term risks of adverse effects to benthic and aquatic communities living in the sediment being remediated. Adverse effects to aquatic habitat and biota would be similar among the alternatives being compared, and would include displacement of fish, and smothering or destruction of aquatic vegetation and benthic organisms. These effects would occur during remedy construction and during the recovery period thereafter. Aquatic vegetation and benthic organisms are expected to be re-established for all alternatives within several growing seasons. The In-Situ Cap and Dredge/Cap Hybrid Alternatives are not predicted

to have other significant short-term risks. The Dredge/Off-Site Disposal Alternative has the potential for short-term risks to human health associated with air emissions of naphthalene and may have significant adverse traffic, safety, noise and related impacts due to transportation of dredged sediments through the City of Duluth. Overall, Alternatives 2 and 3 have relatively low short term risks, while Alternative 4 has somewhat higher short term risks.

6.2.4 Total/Present Value Cost

The estimated costs for each alternative (Table 5.1.2-1) were calculated by the Companies using the same costing method, hourly production rates, efficiencies, labor rates and fixed costs as developed for the cost estimates in the DGR (SERVICE 2002, Appendix C1).

Necessary property acquisition are also included. Public waters mitigation costs are expressed as ranges of costs based on information provided by the DNR. The cost ranges reflect difference in costs depending on whether mitigation is provided on-site, inside the St. Louis River estuary, or outside the estuary.

Natural resource damages associated with the SLRIDT site, which are the subject of a separate assessment by natural resource trustees, and may be the subject of claims by the trustees under State and Federal Superfund laws, are not included. Natural resource damages may vary under the different alternatives, and are part of the Companies' overall liability to the public associated with the SLRIDT site.

Table 6.2.4-1 Cost Summary for Retained Alternatives

Alternative	Estimated Cost
Alternative 1: No Further Action	Not Evaluated
Alternative 2: In-Situ Cap	$31.7 to $42 Million
Alternative 3: Dredge/Cap Hybrid	$43.8 to $48.2 Million
Alternative 4: Dredge/Off-Site Disposal	$94.9 to $110.7 million

The following conclusions can be drawn about the cost of the evaluated alternatives:

- The In-Situ Cap Alternative could be the least costly, but has high cost uncertainty because of mitigation requirements.
- The Dredge/Cap Hybrid Alternative is a midrange in cost, and is not significantly more costly than the In-Situ Cap Alternative; and
- The Dredge/Off-Site Disposal Alternative is the most costly alternative, and would cost two to three times as much as other alternatives..

6.2.5 Conclusion on Best Balance Among Balancing Criteria

Under the RFRAs, the MPCA is directed to determine which remedy alternative achieves the "best balance" among the balancing criteria in consideration of the site-specific circumstances. As stated above, the balancing criteria are listed in the RFRA and in this ROD in order of priority, with long-term effectiveness being the most important. Considering the above comparative analysis and the site-specific circumstances as set forth in this ROD, the MPCA concludes that Alternative 3, the Revised Dredge/Cap Hybrid alternative provides the best balance among the balancing criteria for the following reasons:

1. With proper monitoring, O&M, and contingency action, Alternative 3 is expected to maintain RAOs and Cleanup Levels as well as an off-site landfill under Alternative 4 and without the major transfer of contaminants from sediments to other media (land and air) that would occur under Alternative 4. Thus, Alternative 3 achieves at least a comparable degree of long-term effectiveness to Alternative 4. Alternative 3 achieves a superior degree of long-term effectiveness than Alternative 2, which fails to preserve and maintain the unique shallow sheltered bay environment of Stryker Bay.
2. Alternatives 3 and 4 are technically and administratively implementable. There is substantial doubt that Alternative 2 is administratively implementable.
3. Alternative 3 has fewer potential short term risks, especially during remedy construction, than Alternative 4, and is comparable in potential short term risks to Alternatives 2.
4. Alternatives 2 and 3 are relatively comparable in total cost. Because Alternative 3 is judged to have a higher degree of long-term protectiveness than Alternative 2, and because of the substantial doubt that Alternative 2 is implementable, Alternative 3 must be considered more cost-effective than Alternative 2. Because Alternatives 3 and 4 are judged to achieve a comparable degree of long-term protectiveness and implementability, but Alternative 4 is approximately twice as costly, Alternative 3 must be considered more cost-effective than Alternative 4.
5. Overall, Alternative 3 is: (a) implementable; (b) poses comparable or fewer short term risks than other alternatives; and (c) achieves a comparable or superior degree of long-term effectiveness than other alternatives, and does so at a total cost that is approximately half the cost of the one other alternative that provides comparable long-term effectiveness.

6.3 Community Acceptance

The RFRAs direct MPCA to determine the degree of community acceptance of each evaluated alternative and to consider the community's concerns and response action preferences in selecting a remedy. Based on the comments received by the MPCA during the RI/FS process and the public comment period on the Proposed Plan, there was, in general, low support of Alternative 2, high support for Alternative 3, and moderate to high support for Alternative 4. While many comments favored total removal of contaminated sediments (Alternative 4), there were equally as many comments favoring the Revised Dredge/Cap Hybrid.

The MPCA has considered a variety of concerns raised by the community over the years in which the SLRIDT site investigation and remedy selection process for the SedOU has taken place. During the reopened RI/FS process, the community stakeholders actively participated in the process that led to the identification of new hybrid remedies involving mixes of dredging, capping and containment technologies. MPCA has also taken into account the public comments received on the Proposed Plan, which set forth the Revised Dredge/Cap Hybrid Alternative as the MPCA's preferred remedy alternative. In addition to the responses summarized in the responsiveness summary in Appendix 1, and referenced in other Sections 1.3.5, 5.2.2.3, 5.2.3.3, and 5.2.4.3, of the ROD, the MPCA has added requirements to the remedy selected in this ROD related to long-term monitoring, O&M, contingency action, and financial assurance that are directly responsive to public comments.

6.4 Conclusions Regarding Remedy Selection Criteria

Having completed the comparative analysis of alternatives, according to the remedy selection criteria as required by the RFRAs, the MPCA determines that Alternative 3, Revised Dredge/Cap Hybrid best satisfies those criteria for the SedOU at the SLRIDT site. Section 8 of this ROD sets forth the remedy components and other elements of the selected remedy, and discusses other issues that MPCA is required to consider in selecting this remedy under MERLA.

7.0 CONSIDERATION OF EPA'S PRINCIPLES FOR MANAGING CONTAMINATED SEDIMENT RISKS

On February 12, 2002, EPA issued a memorandum entitled "Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites" (EPA 2002a). The memorandum provides guidance for EPA staff to use in planning and conducting response actions for contaminated sediment sites. MPCA and the Companies consulted this EPA guidance during the reopened RI/FS process for the SedOU. The EPA's 11 Risk Management Principles are summarized below along with a brief description of how each principle has been considered in the reopened RI/FS process.

Principle 1—Control Sources Early. *As early in the process as possible, site managers should try to identify all direct and indirect continuing sources of significant contamination to the sediments under investigation.*

The sources of PAH releases at the SLRIDT site were primarily wastewater discharges from facilities formerly located on the SLRIDT site. The last industrial discharges from facilities at the SLRIDT site were terminated no later than 1961 when Interlake Iron shut down the last operating facility. The TSOU removed the tar area at the 48-inch outfall to prevent additional contamination from seeping into the water south of the 54th Avenue Peninsula. Remediation completed for the SOU reduced the potential for surface soil contaminants from eroding to the surface waters. The 48-inch outfall line was also cleaned or removed to reduce runoff sources. In addition, some contaminated sediments at the north end of Slip 6 were dredged and disposed of by thermal treatment or off-site landfill to reduce impacts to environment. Urban runoff and atmospheric fallout and the river's wash load continue, but are not likely sources for recontaminating the SLRIDT site at concentrations above ambient background. All remedy alternatives considered for the SedOU required the establishment of conservation easements along SLRIDT site shorelines to create buffer zones which will help to protect the adjacent waterbodies from future erosion from the remediated SOU areas and will enhance existing and re-established habitat in the waterbodies.

Principle 2—Involve the Community Early and Often. *Contaminated sediments sites often involve difficult technical and social issues. As such, it is especially important to ensure early and meaningful community involvement by providing community members with technical information needed for their informed participation. In accordance with EPA guidance, site managers and community involvement coordinators should take into consideration the following six practices: Energize the community involvement plan; provide early, proactive, community support; get the community more involved in the risk assessment; seek early community input on the scope of the RI/FS; encourage community involvement in identification of future property use, do more to involve communities during removals.*

As discussed in Section 1.3.5, the community has been extensively involved throughout the RI/FS process. In the early 1990s, a Community Work Group (CWG) was formed for the SLRIDT site. The CWG continues to meet regularly and participants were encouraged to participate in work plans and alternatives development, and they have been informed of all technical results from remedial investigation studies. The community residents, city officials, Site property owners and other community representatives were involved along with state,

Federal and tribal Natural Resource Trustees (NRTs) and managers, and other stakeholders in two stakeholder meetings in 2003. During the stakeholders' meetings, local preferences for use of the land and water areas of the SLRIDT site were discussed at length and stakeholders participated in developing new ideas for hybrid remedy alternatives involving dredging, capping and containment. Websites are maintained by one of the Companies and by the MPCA that offer internet access to key studies and information. All reports are available in the local library and at the office of the MPCA.

Principle 3—Coordinate with States, Local Governments, Tribes and Natural Resource Trustees. *Site managers should communicate and coordinate early with states, local governments, tribes and all NRTs [natural resource trustees].*

Because the SLRIDT site is a State-lead site and is part of a Deferral Pilot Program discussed in Section 1.3.3, MPCA staff are the managing the RI/FS process as well as remedy selection and implementation. MPCA has communicated with EPA about the Reopened RI/FS process pursuant to the Deferral Pilot Program, and EPA participated in identifying Data Gaps for the Reopened RI/FS. EPA staff attended the stakeholder meetings in 2003 that helped to develop new hybrid remedy alternative.

Throughout the RI/FS and reopened RI/FS process, the MPCA and Companies coordinated with local entities and organizations including:

- The City of Duluth, including the Mayor, City Council Members, Housing and Redevelopment Authority, Planning and Development, and Engineering
- The Metropolitan Interstate Committee through its Harbor Technical Advisory Committee, which includes representatives of:
    - DNR
    - WDNR
    - The Minnesota Department of Transportation
    - The Wisconsin Department of Transportation
    - The Seaway Port Authority of Duluth
    - Save Lake Superior Association
    - Audubon Society
    - Port User Representatives
    - EPA
    - US Coast Guard
    - US Army COE
    - US Fish and Wildlife Service
    - Cities of Duluth and Superior
    - MPCA
    - Douglas County, WI
    - The Western Lake Superior Sanitary District (WLSSD)
- MDH
- Spirit Valley Citizens Neighborhood Development Association
- Neighborhood Planning District 2
- The Contaminated Sediments Workgroup of the St. Louis River Citizen's Action Committee (CAC), which has developed a habitat plan for restoration of the St. Louis River Estuary, and helps to implement the St. Louis River Remedial Action Plan. (In an

effort to clean up the most polluted areas in the Great Lakes, the United States and Canada, in Annex 2 of the Great Lakes Water Quality Agreement, committed to cooperate with State and Provincial Governments to assure that Remedial Action Plans are developed and implemented for all designated Areas of Concern in the Great Lakes basin.) Members of the CAC include private citizens, as well as representatives from industries (e.g., Georgia-Pacific Corp., Minnesota Power, Potlatch Corporation), nonprofit organizations (e.g., Muskies, Inc.), the WLSSD, universities, the Fond du Lac Band of Lake Superior Chippewa, consultants and local, state, tribal and Federal government agencies.

- The CWG; including representatives of many of the entities listed above and:
    - Residents of the neighborhoods near the SLRIDT site, and
    - Interested current land owners, including Hallett

The MPCA and the Companies communicated and exchange data with the NRTs (Natural Resource Trustees). The NRTs prepared a Comparative Preliminary Estimate of Damages that reflected their thinking on natural resources restoration, and the MPCA and the Companies considered the trustees' views during their deliberations on alternatives. This ROD will help facilitate settlement discussions with the NRTs concerning natural resource restoration and damages. All studies prepared under the Agreement between the Parties have been provided to the NRTs and the NRTs have often shared their plans and data as they became available.

The DNR is an NRT and also regulates dredging and filling in public waters, such as those at this SLRIDT site. The DNR participated extensively in technical discussions with the MPCA and the Companies that were intended to formulate a permittable remedy and define mitigation requirements. DNR's approval of a public waters permit for the remedy, including mitigation requirements also is an ARAR which must be met for the remedy.

During the reopened RI/FS process, the MPCA also established a Technical Advisory Group (TAG) composed of natural resource managers with interest in the SLRIDT site. The TAG advised the MPCA about the site-specific ecological effects data collection activities conducted by MPCA to help set RAOs and Cleanup Levels for the SedOU.

Principle 4—Develop and Refine a Conceptual Site Model that Considers Sediment Stability. *A CSM identifies all known and suspected sources of contamination, the type of contaminants and affected media, existing and potential exposure pathways, and the known or potential human and ecological receptors that may be threatened. A CSM is especially important at sediment sites because the interrelationship of soil, surface and groundwater, sediment, and ecological and human receptors is often complex.*

As part of the DGR, a CSM was developed for the SLRIDT site. In that report it is described as an Integrated Fate and Transport Model (SERVICE 2002). Its purpose was to summarize the interrelationships of soil, surface and ground water, sediment, and ecological and human receptors that define the SedOU, and the temporal, physical and chemical forces that affect its stability. Numerous potential transport mechanisms and exposure pathways were identified in the model and subsequently studied and evaluated in the DGR and reviewed by the PRT and the MPCA. The MPCA has incorporated the CSM into Section 2.0 of this ROD.

Principle 5—Use an Iterative Approach in a Risk-Based Framework. *Although there is no universally accepted, well-defined risk-based framework or strategy for remedy evaluation at sediment sites, there is wide-spread agreement that risk assessment should play a critical role in evaluating options for sediment remediation. Each iteration might provide additional certainty and information to support further risk-management decisions, or it might require a course correction. An iterative approach may also incorporate the use of phased, early, or interim actions.*

Risks have been iteratively evaluated at this SLRIDT site since the initial Ecological and Human Health risk assessments in 1997. That data was reevaluated by the MPCA in 1999, and EPA Region 5 evaluated the studies in 2000 as part of the data gap review. In 2001, the MPCA gathered more ecological risk information as did the NRTs. The MPCA has included their current analysis of site-specific ecological risk in Appendix 3 to this ROD. The RAOs, Cleanup Levels and ARARs are established in the Section 3 of the ROD. A Human Health Screening Evaluation (HHSE) for the SedOU was prepared by the MPCA in 1997 and updated in February 1998 and November 1999 to assess the potential health risk to people who would most likely be exposed to contaminants in the sediment and water at the SLRIDT site – people wading and swimming in the Bay. The HHSE has been updated again for this ROD. That update is summarized in Section 2.4 and in Appendix 2a.

Testing and modeling recommended by the PRT were conducted on all potential transport pathways to project the effects of remedial actions on the short- and long-term fate of contaminants in light of risk reduction goals. These models were iteratively run and presented by the Companies to the MPCA and PRT in a series of meetings to refine the results.

Principle 6—Carefully Evaluate the Assumptions and Uncertainties Associated with Site Characterization Data and Site Models. *The uncertainties and limitations of site characterization data, and qualitative or quantitative models (e.g., hydrodynamic, sediment stability, contaminant fate and transport, or food-chain models) used to extrapolate site data to future conditions should be carefully evaluated and described. Due to the complex nature of many large sediment sites, a quantitative model is often used to help estimate and understand the current and future risks at the site and to predict the efficacy of various remedial alternatives. All new models and the calibration of models at large or complex sites should be peer reviewed consistent with EPA's peer review process.*

The Parties sought the opinion of EPA Region 5, the COE and the PRT that was selected under the 2000 Agreement between MPCA and the Companies. The PRT was selected and tasked in accordance with EPA's "Peer Review Handbook" (EPA 100-B-00-001, http://www.epa.gov/ORD/spc/2peerrev.htm) in developing the scope of studies for the re-opened RI/FS. The PRT Coordinator and members are as follows:

DISCIPLINE	MEMBERS
Coordinator	Ms. Nancy Musgrove, Management of Environmental Resources
Dredging	Dr. Michael Palermo, USACE, Waterways Experiment Station Dr. Donald Hayes, University of Utah, Dept. of Civil and Env. Engineering

Capping	Dr. Ram Mohan, Blasland, Bouck and Lee, Inc Dr. Thomas Fredette, USACE, New England District
Hydrogeology	Dr. Donald Rosenberry, U.S. Geological Survey Dr. Stanley Feenstra, Applied Groundwater Research, Ltd.
Cost Estimating	Mr. Alex Sumeri, USACE, Seattle District (retired) Mr. John Henningson, P.E., Henningson Environmental Services, Inc.

The Companies undertook numerous new studies at the suggestion of the PRT, specifically to quantify and model potential future remedial activities where earlier studies had made qualitative estimates. A series of seven 1- or 2-day meetings over a year's time were held between the Parties and the PRT to discuss, evaluate and resolve uncertainties inherent in the models. Other outside experts were also consulted on specific modeling issues. Where data does not exist, the Parties and PRT agreed upon assumptions to use based largely on the experience and judgment of the PRT. Models were revised and rerun to reflect changes recommended at these meetings to generate results in the full light of the assumptions and uncertainties (PRT 2003 and PRT 2004).

Principle 7—Select Site-specific, Project-specific, and Sediment-specific Risk Management Approaches that will Achieve Risk-based Goals. *EPA's policy has been and continues to be that there is no presumptive remedy for any contaminated sediment site, regardless of the contaminant or level of risk. All remedies that may potentially meet the removal or remedial action objectives (e.g. dredging or excavation, in-situ capping, in-situ treatment, monitored natural recovery) should be evaluated prior to selecting the remedy.*

As described in Section 4.0, a wide range of remedial alternatives were evaluated for the SedOU. No presumptive remedy has been identified for SedOU at the SLRIDT site. Approximately 12 alternatives were described in RI/FS documents. These alternatives were compared and screened pursuant to the process required under the MPCA RFRA. Three remedy alternatives plus the No Action Alternative were identified for evaluation in the reopened RI/FS under the 2000 Agreement between MPCA and the Companies. After submission of the DGR in the reopened RI process, and before commencing the FS, the Parties, the DNR, the PRT, and other stakeholders formulated and discussed at least seven additional hybrid remedy options, all of which were intended to combine previously identified remedial technologies to balance a broad set of environmental, natural resource, property use and other goals and interests expressed at two all-day stakeholder meetings. This process led to the inclusion of a dredge/cap hybrid alternative in the FS.

Principle 8—Ensure that Sediment PRGs are Clearly Tied to Risk Management Goals. *Sediment cleanup levels have often been used as surrogates for actual remediation goals (e.g. fish tissue concentrations or other measurable indicators of exposure relating to levels of acceptable risk). While it is generally more practical to use measures such as contaminant concentrations in sediment to identify areas to be remediated, other measures should be used to ensure that human health and/or ecological risk reduction goals are being met. Such measures may include direct measurements of indigenous fish tissue concentrations, estimates of wildlife reproduction, benthic macroinvertebrate indices, or other "effects endpoints" as identified in the baseline risk assessment. For many sites, achieving remediation goals, especially for bioaccumulative contaminants in biota, may take many years. Site monitoring data and new scientific information should be considered in future reviews of the site (e.g., the Superfund five-year review) to ensure that the remedy remains protective of human health and the environment.*

As discussed under Principle 5, an iterative approach has been used to evaluate risk, and the uncertainty of those risks has been addressed via an iterative discussion of modeling results. The MPCA, the Companies and the PRT have concluded that both capping and dredging technologies are capable of protecting human health and the environment when implemented under appropriate standards and when properly monitored and maintained. Human uses of the SLRIDT site include swimming and wading in Stryker Bay, recreational boating or maritime shipping, and fishing. If capping is used, the risk management goal to protect the aquatic plant and animal community and to protect those human uses that are associated with the SLRIDT site would be accomplished by isolating contaminants from the BAZ. If dredging is used, in addition to protecting from exposure by removing most of the mass of contamination, a post-dredging cover would dilute any remaining dredge residue to protective levels or isolate human uses from any residual contaminants.

Based on MPCA's iterative evaluation of human and ecological risk, and using the results of the most recent sampling and analysis at the SLRIDT site, the MPCA has set RAOs and Cleanup Levels as specified in Section 3.0 necessary to protect human health and the environment.

Principle 9—Maximize the Effectiveness of Institutional Controls and Recognize their Limitations. *Institutional controls, such as fish consumption advisories and waterway use restrictions, are often used as a component of remedial decisions at sediments sites to limit human exposure and to prevent further spreading of contamination until remedial action objectives are met. While these controls can be an important component of a sediment remedy, site managers should recognize that they may not be very effective in eliminating or significantly reducing all exposures. Site managers should also recognize that institutional controls seldom limit ecological exposures. If additional monitoring data or other site information indicates that institutional controls are not effective, additional actions may be necessary.*

Active remedial measures such as dredging, containment, and capping are the primary means of limiting exposure at the SLRIDT site. Institutional controls will be used to enhance and support these measures. All remedial alternatives include conservation easements along SLRIDT site shorelines which will enhance protection of ecological and other natural resources. Institutional controls are discussed in Section 3.3.1.1.

Principle 10—Design Remedies to Minimize Short-term Risks while Achieving Long-term Protection. *Sediment cleanups should be designed to minimize short-term impacts to the extent practicable, even though some increases in short-term risk may be necessary in order to achieve a long-lasting solution that is protective. In addition to considering the impacts of each alternative on human health and ecological risks, the short-term and long-term impacts of each alternative on societal and cultural practices should be identified and considered, as appropriate.*

The analysis of remedy alternatives has been completed using the remedy selection criteria in the RFRAs and is presented in Section 5.

Principle 11—Monitor During and After Sediment Remediation to Assess and Document Remedy Effectiveness. *A physical, chemical, and/or biological monitoring program should be established for sediment sites in order to determine if short-term and long-term health and*

ecological risks are being adequately mitigated at the site and to evaluate how well all remedial action objectives are being met. Monitoring should normally be conducted during remedy implementation and as long as necessary thereafter to ensure that all sediment risks have been adequately managed. Baseline data needed for interpretation of the monitoring data should be collected during the remedial investigation.

Depending on the risk management approach selected, monitoring should be conducted during implementation in order to determine whether the action meets design requirements and sediment cleanup levels, and to assess the nature and extent of any short-term impacts of remedy implementation. This information can also be used to modify construction activities to assure that remediation is proceeding in a safe and effective manner. Long-term monitoring of indicators such as contaminant concentration reductions in fish tissue should be designed to determine the success of a remedy in meeting broader remedial action objectives. Monitoring is generally needed to verify the continued long-term effectiveness of any remedy in protecting human health and the environment and, at some sites, to verify the continuing performance and structural integrity of barriers to contaminant transport.

The remedy alternatives evaluated for the SedOU include long-term post-remediation monitoring and O&M appropriate to the remedial technologies and components associated with each alternative, and with the RAOs, Cleanup Levels, and ARARs for the SLRIDT site. For example, bulk sediment in the BAZ of capped areas would be sampled to confirm that the required isolation of contaminants is occurring. In addition, samples of aquatic biota would be collected to determine the effectiveness of the remedy in preventing the migration of contaminants from sediment into the biota at concentrations that would adversely affect the food chain, including humans who consume fish. Consistent with EPA's principle 11, monitoring will be conducted until the data demonstrates that all sediment risks have been adequately managed. Additionally, for aquatic habitat mitigation, monitoring of restored habitat would be conducted to document the mitigation required in the DNR's permit.

8.0 SELECTED RESPONSE ACTION ALTERNATIVE AND CONCEPTUAL DESIGN

8.1 Selection of Alternative 3, Revised Dredge/Cap Alternative

Having evaluated the remedy alternatives presented in the reopened RI/FS according to the remedy selection criteria in the RFRAs, the MPCA has determined that Alternative 3, Revised Dredge/Cap Hybrid best satisfies those criteria for the SedOU at the SLRIDT site. This section describes, in detail, the components of the selected remedy. The selected remedy includes the remedy components described in Section 4.2.3 with the modifications set forth in this section, including a number of modifications which address comments received by the MPCA during the public comment period as summarized in Section 5.2.3.2. This section also describes how the selected remedy satisfies other requirements that must be addressed under MERLA.

The MPCA has determined that implementation of the selected remedy is reasonable and necessary to protect the public health or welfare from actual or threatened releases of hazardous substances into the environment at the SLRIDT site. The selected remedy must be implemented so as to meet the RAOs, Cleanup Levels and ARARs identified for that alternative in Section 3. The selected remedy must be implemented in accordance with Exhibit B to the May 25, 1995, RFRA. In addition, all remedial actions must be implemented in accordance with an MPCA-approved RD/RA Plan. Remedy components and required elements are presented below.

8.2 Remedy Components, and Other Required Elements of Remedy

The selected remedy consists of a combination of environmental dredging, in-situ capping, and dredged sediment containment. The components of the selected remedy are illustrated in Figure 4.2.3-1 and described in detail below. Other elements required in order to implement the selected remedy include long-term monitoring, O&M, contingency action, financial assurance, institutional controls and property acquisition and relocation. The remedy requirements of the WDNR for the portion of the SedOU which is located in the waters of the State of Wisconsin are set forth in Appendix 9 to this ROD. The requirements in Appendix 9 are enforceable by the State of Wisconsin.

8.2.1 Remedy Components

Dredging. Dredging will be conducted in approximately 25 acres of contaminated sediment (estimated at approximately 224,000 cubic yards) across the SLRIDT site where concentrations exceed the Cleanup Level of 13.7 mg/kg TPAH.

The areas to be dredged include approximately 22 acres of contaminated sediment in Stryker Bay or about 70% of the area of Stryker Bay, 0.3 acres in Slip 6, 2 acres of on-shore wetlands in Slip 7, and 3 acres in the Minnesota Channel (see Figure 4.2.3-1). This estimate includes dredging sediment that exceeds the Cleanup Level of 13.7 mg/kg TPAHs within the State of Wisconsin waters in Slip 6 (0.3 acres) and the navigation channel (1.1 acres) (see Appendix 9)

Dredging in Stryker Bay includes most of the silty and sandy substrate areas, which are not compressible through surcharging. The areas to be dredged are not associated with the highest concentrations of naphthalene in the contaminated sediments. Dredging will be conducted in

order to achieve mass removal of most of the contaminated sediment layer and to maximize restoration of pre-remedy water depth. The entrance to Stryker Bay will also be dredged to maintain adequate water flow into the Stryker Bay and recreational navigation access for shoreline owners, and other users. In the northernmost contaminated area, the DNR requested dredging to create a sediment trap for detritus delivered by the unnamed tributary stream.

Post-dredge cover material will be placed on the dredged areas described above (except dredged areas in Wisconsin waters), to isolate any dredge residual, restore pre-dredge bathymetry (depth) and provide a substrate for reestablishing habitat (sediment type) that meets DNR permit requirements. Pursuant to Appendix 9 to this ROD, no post-dredge cover is required in the dredged areas in Wisconsin waters.

Dredging will be conducted using a technique that is designed to minimize dredge residual and resuspension of sediments. Hydraulic and mechanical dredging will be evaluated further prior to RD/RA Plan to determine their effectiveness at contaminated sediment removal. The dredging method shall be approved by the MPCA and shall be specified in the RD/RA Plan. In approving the method of dredging, the MPCA will consider the effects of the method on potential resuspension and odor problems, the degree of precision and completeness of removal of contaminants obtainable by the method; volume of dredge water requiring treatment; and overall cost-effectiveness.

The RD/RA Plan must include minimum depth requirements for dredging, based on the known extent of contamination, and a carefulness specification which together are adequate to assure careful and complete removal of contaminated sediments, within the limits of well operated and appropriately selected equipment. A pilot study may be necessary to determine whether the chosen dredging method will adequately remove contamination, and control odors, and to fully develop the carefulness specifications. At a minimum the specifications shall include:

- A general carefulness specification indicating the need to dredge carefully and minimize suspension of sediments;
- Prohibition of certain activities such as under water stockpiling and spreading of sediment;
- Engineering control measures during remedy implementation may include silt curtains and/or other appropriate control structures used to control, contain, and minimize the release of sediment to protect downstream water quality and aquatic resources;
- Turbidity monitoring (e.g. within the dredge area and up and down stream from dredging, any increase in background turbidity will be considered an increase resulting from dredging operations);
- Operational controls in response to monitoring (e.g. reduced production rate, reduced hours of operation, sequencing and timing to minimize impacts to the aquatic environment, etc.);
- Equipment requirements (e.g., specifying environmental cable arm bucket or equivalent, or a shroud on a hydraulic dredge); and
- Development of a sediment management plan to minimize odors during dredging, transport and placement of contaminated sediments.

After sediment is dredged in accordance with an MPCA approved RD/RA Plan post dredge verification analysis shall be conducted as set forth in Section 3.2.6.

Dredge Water Management within the CAD. Treatment and disposition of water associated with dredged materials placed in the CAD must comply with ARARs, RAOs and Cleanup Levels. Options include: dredge water treatment at the CAD prior to discharge to the WLSSD; or discharge to the St. Louis River with a higher level of treatment. Treatment will likely include flocculation with chemicals to settle solids. Sand filtration may be used to further reduce solids to meet pre-treatment standards. Additional treatment with GAC will be necessary if dredge water is discharged to the St. Louis River in order to meet ARARs, RAOs and Cleanup Levels.

Backwash water could be returned to the inlet of the CAD. An additional pump lift station would likely be required to handle the 250 gallons per minute flow (per dredge) for discharge to the WLSSD sewer system and a pipeline dedicated to access the WLSSD force main lift station. To minimize the discharge, a dredge slurry system could be used which would recirculate settled water from the CAD to make up a slurry of about 16% solids to transport dredged sediment.

Capping and Surcharging**.** All of the undredged portion of Stryker Bay (estimated at approximately 11acres) will be capped and surcharged to restore pre-remediation bathymetry (water depth) and provide an appropriate substrate to reestablish habitat. Surcharging the sediments of Stryker Bay will compress and consolidate the underlying sediments. The capped portions of Stryker Bay contain the highest naphthalene concentrations and are mainly overlying peat areas that will compress with minimal additional surcharge material. Activated carbon mats that also provide a root barrier function may be utilized as an additional reactive/adsorptive IZ layer within the cap, but are not intended to reduce the required thickness of the BAZ or IZ. After consolidation is complete, the surcharge material will be removed to achieve desired water depths over the capped areas of Stryker Bay. Removed surcharge material will be used as capping material in other parts of the SLRIDT site.

Capping of contaminated sediments will be conducted on all areas in Keene Creek Bay/Slip 7 that exceed the Cleanup Level of 13.7 mg/kg TPAH (estimated at approximately 28 acres), including an area of on-shore wetlands of Keene Creek Bay/Slip 7.

Engineering control measures will be used during capping including silt curtains and/or other appropriate control structures to control, contain, and minimize the release of sediment to protect downstream water quality and aquatic resources.

Capping and surcharging in Stryker Bay will be designed to isolate contaminants without significantly reducing water depths and natural resource values, thus preserving and restoring shallow sheltered bay conditions. Capping and surcharging in the Stryker Bay will also reduce potential human health risks from air emissions, restore habitat substrate, improve ecological conditions of the shoreline, and diversify habitat.

All capping must achieve a post-remediation cap thickness required by the MPCA to assure adequate protectiveness of human and ecological receptors. The upper layer of the caps will be composed of a substrate material that meets DNR requirements for aquatic and wetland habitat development. Transitional habitats will be established along shallow cap slope areas of Keene Creek Bay/Slip 7 and the CAD containment dike slope south of Slip 6.

All capped areas that are susceptible to erosion by currents, waves, prop wash, or ice will be armored to prevent erosion. These areas include, but are not limited to: the entrance to Stryker

Bay; the mouth of 62nd Avenue West creek; slopes adjacent to the main cannel; and areas exposed to waves on the southern portion of the SLRIDT site peninsulas.

Containment. All dredged material will be placed in an approximately 15-acre CAD constructed in Slip 6. An earthen dike or sheet piling will be used to segregate dredge water in the CAD from surface water and the adjacent wetlands. The end of the dike will likely have 2:1 slopes and be constructed of granular fill. The construction of sheet piling and end dike are described in the DGR (Service 2002); Appendix D3).

The dike will be located south of the dock structure in Slip 6 and will not extend into Wisconsin waters. This configuration is intended to provide necessary containment capacity; avoid the need to seal the cribbing of the dock wall against leakage of dredged material; and take advantage of the firmer sandy foundation at the south end of the slip.

The centerline of the dike is estimated to be located about 165 feet south of the south end of the dock wall Station 0+00. The CAD at this location will be able to store the expected volumes when filled to an elevation ranging from 596 to 600. This will leave 1 to 5 feet of water above the CAD when filling is completed. Consolidation of the CAD material and underlying sediments will lead to greater water depth until consolidation has completed.

The CAD will be covered with a cap that, at a minimum, meets all requirements of the remedial cap described above. A 5-foot thick cap, designed and monitored in the same manner as other caps to be used in this Alternative, was assumed for the CAD and additional substrate material may be added to the CAD over time to achieve DNR required habitat depths as the CAD settles. During design, dredge volumes and CAD design details will continue to be evaluated. The final CAD design will be presented in the RD/RA Plan.

Engineering control measures will be used during construction and filling of the CAD including silt curtains and/or other appropriate control structures used to control, contain, and minimize the release of sediment to protect downstream water quality and aquatic resources. In comments to the MPCA Proposed Plan, the US Fish and Wildlife Service recommended the CAD include a deterrent system to discourage birds and other wildlife from using the contaminated CAD. The MPCA will present this recommendation to the DNR for inclusion in their work in public waters permit.

Shoreline Buffer Zones. A riparian buffer zone will be established along the eastern shore of Stryker Bay as shown in Figure 4.2.3-1, to support and maintain the response actions and reestablish habitat in Stryker Bay. The buffer zone will be approximately 200 feet in width, subject to terrain and industrial operations needs, and will include all of the SLRIDT site land within the State of Wisconsin (far southeastern tip of the 59th Street Peninsula). A riparian buffer zone will also be established along the eastern side of Dock 7, and in the land and wetlands between Slips 6 and 7 (54th Avenue Peninsula). Additional substrate and habitat development may be required by the DNR.

Monitoring During Remedy Construction**.** The RD/RA Plan will describe all monitoring requirements during remedy construction which are necessary to confirm that all ARARs, RAOs

and Cleanup Levels are complied with. The monitoring requirements that will apply during construction of the remedy include:

- Borrow Material. Representative samples of borrow material used to construct dikes, caps and covers will be subject to physical, chemical monitoring, and invasive species monitoring to assure they meet DNR permit requirements.
- Air Quality Emission Controls. Air quality monitoring and control measures will be conducted to assure protection of public health and the environment and compliance with RAOs during remedy implementation. Because the areas of highest naphthalene concentrations (shown in mg/Kg dry weight in Figure 4.2.3-2) will be capped (see Capping and Surcharging below), the likelihood of exceeding ambient air quality RAOs is significantly reduced. Response to air emissions during remedy construction will be implemented as shown in Table 3.2.4-1. Responses may include PAC, cover or other MPCA approved mitigation measures applied in the CAD during dredging and dewatering operations.
- Dredge Water. Representative water samples will be collected for chemical analysis to assure that MPCA and WLSSD standards are met for any treated dredge water sent to WLSSD or discharged to the St. Louis River. Dredge water must be managed in accordance with RAOs, Cleanup Levels and ARARs specified in Section 3.0.
- Surface Water. Surface water monitoring will be conducted during all in-water construction activities and dewatering of the CAD to assure water quality outside of the designated treatment/work zones meets water quality ARARs. Surface water will be monitored outside the outermost engineering control structure and at the point of discharge to the river for treated dredge water (if any) for compliance with RAOs, Cleanup Levels and ARARs.
- Coring and Settlement of Cap. Settlement monitoring of the cap and surcharge areas will be conducted throughout the construction phase of the project to assure thicknesses and substrate meet MPCA and DNR standards.
- Post Dredge Verification Sampling. Post dredging verification standards and sampling requirements are discussed in Section 3.2.6. If analytical results indicate the presence of residual contamination above the RAOs, Cleanup Levels, and ARARs, long-term monitoring of the post-dredge residual cover will be required similar to long-term monitoring of the CAD and in-situ Cap discussed in the following section. Post-dredging monitoring for areas dredged in Wisconsin waters is described in Appendix 9.

Long-term monitoring is also required after completion of remedy construction. Section 3 requires the submission of a monitoring plan, O&M plan and contingency action plan as part of the RD/RA Plan, and sets forth specific requirements that must be addressed in these plans.

8.3 Other Considerations Under Minnesota Environmental Response and Liability Act

8.3.1 Long Term Assurance of Protectiveness

8.3.1.1 Institutional Controls

In accordance with MERLA, Minn. Stat. § 115B.16, subd. 2, the RPs and the MPCA will develop an Affidavit Concerning Real Property Contaminated with Hazardous Substances (Affidavit) to be recorded with the county recorder of St. Louis County by the owner of the property. The Affidavit shall include a description of the property including: the location of the property and its street address; a registered or recorded survey of the property that includes the

areas of contamination; a precise description of the nature and extent of contamination that remains after remedy construction is completed.

The RD/RA Plan will identify specific institutional controls, including restrictive covenants and easements, needed to assure long-term protection of public heath and welfare, and the environment. Specifically, institutional controls must be designed to assure that the remedy provides effective long-term isolation of contaminated material, and shall impose appropriate restrictions on uses and activities on the property which would disturb or interfere with the remedy. These institutional controls may include the following:

- Anchoring or other disturbances, temporary or permanent, may be prohibited within the footprint of the remediated areas. Anchoring restrictions will be communicated with signs on shore.
- Docks, piers, or other temporary or permanent structures can not be constructed within the footprint of the CAD or in-situ capped areas without a construction plan approved by the MPCA. In some circumstances, DNR and COE approval may also be necessary.
- Dredging would be prohibited within the SLRIDT site remediation boundaries without a dredged plan approved by the MPCA. In some circumstances, DNR and COE approval may also be necessary.
- It is assumed that there would be no institutional controls in the Wisconsin portion of the remediated area.

Institutional controls shall be recorded with the St. Louis County property records by the property owners.

8.3.1.2 Long-Term Operation and Maintenance, Monitoring and Contingency Action

The remedy shall be implemented in accordance with long-term monitoring, O&M and contingency action plans approved by the MPCA as part of the RD/RA Plan. These plans shall meet all of the requirements set forth in the RAOs, Cleanup Levels and ARARs for the selected remedy and other requirements set forth in Section 3.

Performance of the selected remedy will be reviewed every five years pursuant to the Federal Superfund law.

8.3.1.3 Financial Assurance

Financial assurance to carry out the long-term monitoring, O&M and contingency action plans approved as part of the RD/RA Plan must be demonstrated as required in Section 3.3.1.3. Financial assurance must be demonstrated before commencing construction of the CAD.

8.3.2 Planned Use of Property

As stated in Section 3.3, MERLA provides that, in determining the standards to be achieved by response actions to protect public health and welfare and the environment from a release of hazardous substances, the MPCA must consider the planned use of the property where the release is located. This purpose of this provision of MERLA is to allow the MPCA to select cleanup standards that provide a level of protection that is compatible with the uses of the SLRIDT site property that can be reasonably foreseen.

The planned use of the property within the SedOU appears to vary depending upon the portion of the SedOU involved. Planned use of Stryker Bay is the restoration and preservation of shallow sheltered bay conditions, including natural habitat recreational, navigational and other uses, including riparian uses. Planned use of the navigational channel is to remain available for navigational use as long as the channel is maintained by the COE.

Planned use of the two slips is closely associated with the plans of the current owner of the slips and the adjacent land. The MPCA understands that Hallett and XIK have reached an essentially final agreement for the purchase of both slips, Dock 7 and the 54th Street peninsula by XIK for purposes of implementing the SedOU remedy. Pursuant to that Agreement, it is Hallett's plan to relocate its shipping operations from Slips 6 and 7 to a different location within the Duluth Harbor. Thus, the current owner's plans for the property are to cease the use of the two slips for maritime navigation. The MPCA is not aware of any person who seeks to acquire the Hallett property for maritime use.

The cleanup standards described in this ROD (ARARs, RAOs and cleanup levels) are based on protection of aquatic and semi-aquatic life and associated habitat, and protection of human health as affected by the food chain, direct ingestion and dermal contact. These cleanup standards will provide protection of public health and welfare and the environment that is consistent with any planned or potential future uses of the property within the SedOU, including natural resource and habitat restoration, navigation and recreational uses. These cleanup standards are also compatible with the use of the adjacent land for residential, recreational, habitat restoration, or commercial and industrial use.

Although the cleanup standards set for the selected remedy are compatible with planned uses of the property as understood by the MPCA, implementation of the remedy will result in the construction of a CAD in Slip 6, and capping of Slip 7, which will affect the future potential of the Site for maritime use. The MPCA has received comments on the Proposed Plan from individuals and organizations, including the City of Duluth, expressing concern about or opposition to the loss of the two slips for maritime use. The MPCA believes that implementation of the selected remedy is not incompatible with the future use of the Site for maritime purposes. A person or organization that wishes to pursue such use in the future will need to work with the MPCA and the property owner to develop the property in a way that does not disturb the implemented remedy. For example, by adding armoring to the capping in Slip 7, or by modifying the configuration of the docking areas adjacent to the navigation channel, the property retains the potential for use for deep water or barge shipping. The MPCA provides assistance for the redevelopment of contaminated property, including Superfund sites such as the SLRIDT Site, through its Voluntary Investigation and Cleanup Program.

8.3.3 MERLA Determination Related to Relocation of Businesses

MERLA requires the MPCA to make specific findings in order to select a remedy that involves costs for permanent relocation of businesses such as the relocation of Hallett in the Revised Dredge/Cap Hybrid remedy. To select this remedy, the MPCA must determine that "alone or in combination with other measures, relocation is more cost-effective than and environmentally preferable to the transportation, storage, treatment, destruction, or secure disposition off-site of

hazardous substances, or pollutants or contaminants, or may otherwise be necessary to protect the public health or welfare."

In analyzing the alternative remedies under the remedy selection criteria in Sections 5 and 6 of this ROD, the MPCA concluded that Alternative 3, which combines the Hallett relocation with dredging, capping and containment, is more cost effective than Alternative 4, which provides for off-site transportation and disposal of the contaminated sediments. In that same analysis, MPCA concluded that Alternatives 3 and 4 provide a comparable level of long-term effectiveness in meeting RAOs, Cleanup Levels and ARARs, but that Alternative 3 has environmental advantages over Alternative 4 because it does not involve major transfer of contaminants from sediments to other media (land and air) and has fewer potential short term risks due to air emissions and transportation risks. Based on this analysis, MPCA concludes that Alternative 3 is environmentally preferable to Alternative 4.

Therefore, pursuant to Minn. Stat. § 115B.02, subd. 16(b)(2), MPCA determines that the purchase and relocation of Hallett from Boat Slip 6 and Slip 7, as required in the Dredge/Cap Hybrid remedy (Alternative 3), when considered in combination with the other components of the Dredge/Cap Hybrid remedy, is more cost-effective than, and environmentally preferable to, the transportation and secure disposition off-site of hazardous substances as required in Alternative 4.

In connection with this determination, MPCA notes that it would also have been required to make a specific determination under MERLA if had chosen to select Alternative 4, because it involves offsite transport of contaminated materials and secure disposition offsite. Based on the analysis of Alternative 4 under the remedy selection criteria in the RFRAs, it appears to MPCA that Alternative 4 would not meet any of the three criteria that allow selection of such a remedy under MERLA: it is not more cost-effective than other alternatives; it has not been shown to create any new capacity to manage hazardous substances; and, because MPCA has determined that Alternative 3 will meet RAOs, cleanup levels and ARARs, it is not necessary to implement Alternative 4 to protect public health or welfare or the environment from risks of further exposure to contamination that will remain at the Site after remedy implementation.

8.3.4 Property Acquisition and Relocation.

Property interests necessary to implement the selected remedy will need to be acquired from Hallett including property interest necessary to construct the remedy in Slip 6, Keene Creek Bay/Slip 7, Dock 7, and the 54th Avenue Peninsula, establish conservation easements along the eastern shore of Stryker Bay to provide the required riparian buffer zone, and establish a riparian buffer zone along the eastern side of Dock 7, and in the land and wetlands between Slips 6 and 7 (54th Avenue Peninsula).

8.3.5 Public Waters Mitigation.

Minnesota law requires that a DNR permit be obtained when the course, current, or cross section of public waters (open water and wetlands) is altered through filling or excavation, including actions to restore those waters. Minimization and mitigation features that may be required under the DNR permit are included in the remedial measures described above. Final mitigation measures will be detailed in the DNR permit. In addition to measures needed to restore water

depths and habitat in the remediated area, DNR has indicated that implementation of the selected remedy is estimated to require mitigation measures to replace up to approximately 13 acres of lost public water and wetland functions and values.

8.3.6 Implementation Schedule and Time until Response Action Objections and Cleanup Levels are Achieved.

Sequencing and duration of the construction phase of remedy implementation will be refined in the design phase.

Capping and surcharging of Stryker Bay will likely be conducted first. Surcharging of Stryker Bay sediments will initially create an upland environment. Therefore, concerns regarding contamination of surcharge material from dredging activities will be minimal during dredging of Stryker Bay. Surcharged areas are estimated to take about two years to achieve the desired settlement.

Hallett is expected to remain in operation at the SLRIDT site throughout the 2004 shipping season. Therefore, construction of the CAD and dredging activities will not begin until 2005. Construction of the CAD is estimated to take approximately 45 days. Dredging is estimated to take 6 to 18 months or the equivalent of one and one quarter construction seasons to complete, assuming a 24 hours per day, 5 days per week dredging schedule. Although construction sequencing is subject to change, total construction time is estimated to be about three years before the cap is placed on Keene Creek Bay/Slip 7 or the CAD due to prior use of the capping sand as surcharge material for Stryker Bay. Implementation of the selected remedy is estimated be completed in approximately four years for the project, with RAOs and Cleanup Levels met in approximately three years in Stryker Bay and three years in Keene Creek Bay/Slip 7.

9.0 DETERMINATIONS

9.1 Findings and Determinations.

Based upon all of the files, records and proceedings of the MPCA related to the SedOU at the SLRIDT site, including but not limited to the documents identified in Section 10 (References) of the ROD and other documents referred to in this ROD, including in the Appendices, the MPCA makes the determinations set forth in this Section 9.

9.1.1 Minnesota Environmental Response and Liability Act

1. The MPCA has authority to take, or require responsible persons to take, response actions to address releases and threatened releases of hazardous substances to the environment at and from the SLRIDT site under Minn. Stat. §§ 115B.01 to 115B.18 of the MERLA.

2. The MPCA has authority to determine what response actions are reasonable and necessary to protect public health and welfare and the environment under MERLA, Minn. Stat. §§ 115B.17, subd. 1 and 115B.18.

3. The MPCA issued Requests for Response Action (RFRAs) under MERLA to responsible persons for the SedOU at the SLRIDT site in 1994 and 1996 (MPCA 1994 and MPCA 1996).

4. Any decision under MERLA, including a decision to select a remedy to address a release of hazardous substances, may be made by the MPCA Commissioner pursuant to § 116.03, subd. 1(c).

5. The Commissioner requested the MPCA Citizen Board to make the decision to select the SedOU remedy pursuant to Minn. Stat. § 116.02, subd. 7.

9.1.2 Procedures

1. Procedures for addressing the release and threatened releases associated with the SedOU at the SLRIDT site, including site investigation, evaluation of alternative remedies, and selection and implementation of a remedy, are set forth in the RFRAs.

2. Additional procedures for selecting and implementing a remedy for the SedOU are set forth in MERLA and in MERLA, and in the Agreement between MPCA and the Companies.

3. MPCA has followed all of the required procedures for selecting the remedy which is set forth in this ROD. In support of this determination, the MPCA makes the further determinations in paragraphs 4 to 8 of this Section 9.1.2. Determinations required by MERLA are set forth in Section 9.1.4.

4. MPCA reviewed and approved, with modifications, the Data Gaps Report (DGR) submitted by the Companies under the Agreement.

5. MPCA reviewed and approved, with modifications, the Feasibility Study (FS) submitted by the Companies under the Agreement.

6. In reviewing and approving the DGR and the FS, the MPCA considered the comments of the Peer Review Group established under the Agreement.

7. The MPCA prepared a proposed plan stating the MPCA's preferred remedy for the SedOU, provided public notice of availability of the plan and of a public meeting on the plan, held a public meeting, provided thirty days for public comment on the plan, and responded to all timely public comments received on the proposed plan.

8. The public meeting held by the MPCA on the Proposed Plan meets the requirements for a public informational meeting under Minn. Rule 7000.0500, subp. 3b.

9.1.3 The Remedy Is Reasonable and Necessary to Protect Public Health and Welfare and the Environment

1. The response actions set forth in this ROD for the SedOU at the SLRIDT site are reasonable and necessary to protect the public health and welfare and the environment from the release and threatened release of hazardous substances as provided in MERLA. In support of this determination the MPCA makes further findings and determinations in paragraphs 2 to 10 of this Section 9.1.3.

2. The MPCA established site-specific RAOs, and Cleanup Levels which must be achieved by the SedOU remedy in accordance with the requirements of the RFRAs.

3. The MPCA identified the applicable and relevant and appropriate requirements (ARARs) which must be met by the SedOU remedy in accordance with the requirements of the RFRAs.

4. The RAOs, Cleanup Levels, and ARARs established and identified in Section 3.0 of this ROD constitute the standards that must be achieved by the SedOU remedy in order to protect public health and welfare and the environment from releases of hazardous substances at and from the SLRIDT site.

5. Criteria for selecting the SedOU remedy are set forth in the RFRAs. The remedy selection criteria consist of the threshold criterion of protection of public health and welfare and the environment; the balancing criteria of long-term effectiveness, implementability, short-term risks, and total costs; and the additional criterion of community acceptance.

6. MPCA reviewed the four remedy alternatives evaluated in the FS in accordance with the remedy selection criteria in the RFRAs.

7. The selected remedy meets the threshold criterion of protection of public health and welfare and the environment under the RFRAs because, when the remedy is implemented

in accordance with the requirements in the ROD, it will meet the site-specific RAOs and Cleanup Levels established by the MPCA.

8. The MPCA compared the selected remedy to the other remedial alternatives evaluated in the FS and determined that the selected remedy provides the best balance among the balancing criteria in consideration of the SLRIDT site circumstances, as provided in the RFRAs.

9. With respect to the criterion of public acceptance, the MPCA has determined the degree of community acceptance of each remedy alternative evaluated in the FS based upon the public meeting and public comments received by MPCA on the Proposed Plan, and other evidence of public, community and stakeholder opinion about the evaluated remedial alternatives.

10. The MPCA determines that there is a reasonable degree of community acceptance for the selected remedy, as well as for the dredge/off-site disposal alternative, with a lesser degree of community acceptance for the all capping alternative.

11. The MPCA considered the community's concerns and response action preferences in selecting the remedy in a variety of ways including: regular and ongoing communication with the Community Work Group for the SLIRDT Site; involving community stakeholders in the reopened RI/FS process to help identify new hybrid remedies involving combinations of dredging, capping and containment technologies; and responding to public comments received on the Proposed Plan by adding requirements for long-term monitoring, O&M, contingency action, and financial assurance to this ROD.

9.1.4 Other MERLA Determinations

1. MPCA's notice of the proposed selection of the remedial action and opportunity for public comment meets the requirements of Minn. Stat. § 115B.17, subd. 2b.

2. In setting the standards to be achieved by the remedy selected in this ROD, the MPCA considered the planned use of the property where the release is located, that is, Stryker Bay, Slips 6 and 7, the navigation channel, and adjacent wetlands, in accordance with Minn. Stat. § 115B.17, subd. 2a.

3. Pursuant to Minn. Stat. § 115B.02, subd. 16(b)(2), the MPCA determines that the relocation of Hallett Dock Company from Slips 6 and 7, when combined with the other elements of the remedy selected in the ROD, is more cost-effective than and environmentally preferable to the transportation and secure disposition off-site of hazardous substances.

9.1.5 The Remedy Is Not Inconsistent With CERCLA and the NCP

1. For purposes of the 1995 Deferral Pilot Agreement between MPCA and the United States Environmental Protection Agency (U.S. EPA) and for other purposes under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA),

the MPCA determines that the remedy selected in this ROD is not inconsistent with CERCLA and the National Contingency Plan (NCP). In support of this determination, the MPCA makes further determinations in paragraphs 2 to 6 of this Section 9.1.5.

2. The remedial investigation and feasibility study process for the SedOU at the SLRIDT site, as provided in the RFRAs and the Agreement, is generally consistent with the process set forth in the NCP

3. The identification of ARARs and site-specific RAOs and Cleanup Levels for the SedOU as provided in the RFRAs is generally consistent with the process set forth in the NCP.

4. The procedures used to provide public notice, opportunity for comment, and response to comments on the Proposed Plan for the SedOU remedy are generally consistent with the procedures in CERCLA and the NCP.

5. The process for evaluating alternative remedial actions and selecting the preferred alternative as provided in MERLA and in the RFRAs is generally consistent with the process set forth in CERCLA and the NCP. In addition, the evaluation took into account and was generally consistent with the guidance provided in the U.S. EPA's Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites.

6. The remedy selected in the ROD will provide the same or a comparable level of protectiveness of human health, welfare and the environment as a remedy selected under CERCLA and the NCP.

9.1.6 Other Determinations In This ROD

1. To the extent that the remedy selected in this ROD is based on or is supported by any determinations made in other sections of this ROD, those determinations are incorporated into the determinations in this Section 9.

9.2 Selection of Remedy

1. The MPCA selects the Revised Hybrid Dredge/Cap Alternative as the remedy for the SedOU at the SLRIDT site. The selected remedy shall be implemented in compliance with the RAOs, Cleanup Levels, ARARs, and other requirements specified in Sections 3.0 and 8.0 of this ROD.

2. This ROD is incorporated in and made an integral part of the RFRAs and shall be implemented in accordance with Exhibit B of the RFRAs.

Issued pursuant to Resolution of the Minnesota Pollution Control Agency Citizens Board approved on _____, 2004.

_____ _____

Sheryl Corrigan Date
Commissioner
Minnesota Pollution Control Agency

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APPENDIX 1. RESPONSIVENESS SUMMARY

APPENDIX 2A. REVIEW AND UPDATE OF HUMAN HEALTH SCREENING EVALUATION

APPENDIX 2B. ESTABLISHMENT OF NAPHTHALENE EMISSION RESPONSE LEVELS

APPENDIX 3. EVAULATION OF ECOLOGICAL EFFECTS DATA

APPENDIX 4. ARARS AND PRELIMINARY REMEDIATION GOALS

APPENDIX 5. GROUNDWATER AND SURFACE WATER RAOS, CLEANUP LEVELS AND ARARS

APPENDIX 6. THIS APPENDIX INTENTIONALLY LEFT BLANK

APPENDIX 7. BIOACTIVE ZONE

APPENDIX 8. FINANCIAL ASSURANCE

APPENDIX 9. WISCONSIN REMEDIATION REQUIREMENTS