**QUALITY ASSURANCE PROJECT PLAN (QAPP):**

**PHASE II GIS-BASED SEDIMENT QUALITY DATABASE FOR THE**

**ST. LOUIS RIVER AREA OF CONCERN**

**(Grant Number GL97540401-2)**

**REVISION: 0**

**May 2004**

**Prepared by: Judy L. Crane**
**Environmental Outcomes Division**
**Minnesota Pollution Control Agency (MPCA)**
**520 Lafayette Road North**
**St. Paul, MN 55155-4194**

| | |
|---|---|
| Judy Crane, MPCA Project Manager | 3 May 04 Date |
| Brian Fredrickson, MPCA Grant Manager | 05/13/04 Date |
| Greg Gross, MPCA Supervisor | May 4, 2004 Date |
| Pat Carey, MPCA Supervisor | 5/14/04 Date |
| Roger Fisher, MPCA Quality Assurance (QA) Coordinator | 5/17/04 Date |
| Donald MacDonald, MacDonald Environmental Sciences Ltd. Project Manager | May 7/04 Date |
| Scott Cieniawski, Great Lakes National Program Office (GLNPO) Project Officer | 5/18/2004 Date |
| Louis Blume, GLNPO QA Officer | 5/18/04 Date |

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Judy Crane, MPCA (Project Manager)
Brian Fredrickson, MPCA (Grant Manager)
Greg Gross, MPCA (Supervisor)
Pat Carey, MPCA (Supervisor)
Roger Fisher, MPCA (QA Coordinator)
Donald MacDonald, MacDonald Environmental Sciences Ltd. (Project Manager)
Scott Cieniawski, Great Lakes National Program Office (GLNPO) (Project Officer)
Louis Blume, GLNPO (QA Officer)
Jim Killian (Wisconsin Department of Natural Resources; WDNR)
Nancy Larson (WDNR)
Linda Talbot (WDNR)
Kim Walz (WDNR)

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# LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AOC | Area of Concern |
| ARDC | Arrowhead Regional Development Commission |
| As | Arsenic |
| AVS | Acid Volatile Sulfide |
| BNAs | Base/Neutrals and Acids |
| BTEX | Benzene, Toluene, Ethylbenzene, and Xylene |
| CAC | Citizen's Action Committee |
| CD | Compact Disk |
| CDF | Confined Disposal Facility |
| COD | Chemical Oxygen Demand |
| DDT | Dichloro-diphenyl-trichloroethane |
| DQA | Data Quality Assessment |
| DQI | Data Quality Indicator |
| DQO | Data Quality Objective |
| DRO | Diesel Range Organics |
| EnPPA | Environmental Performance Partnership Agreement |
| EPA | Environmental Protection Agency |
| ESRI | Environmental Systems Research Institute |
| FIELDS | Fully Integrated Environmental Location Decision Support |
| GC | Gas Chromatography |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| GIS | Geographic Information System |
| GLNPO | Great Lakes National Program Office |
| $H_a$ | Alternative Hypothesis |
| $H_o$ | Null Hypothesis |
| Hg | Mercury |
| IJC | International Joint Commission |
| IT | International Technology |
| LaMP | Lakewide Management Plan |
| MARPLOT | Mapping Application for Response, Planning and Local Operational Tasks |
| MDNR | Minnesota Department of Natural Resources |
| MESL | MacDonald Environmental Sciences Ltd. |
| MN | Minnesota |
| MPCA | Minnesota Pollution Control Agency |
| MS™ | Microsoft™ |
| MSR | Management Systems Review |
| NAD | North American Datum |
| NOAA | National Oceanic and Atmospheric Administration |

## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| PAHs | Polycyclic Aromatic Hydrocarbons |
| Pb | Lead |
| PBDEs | Polybrominated Diphenyl Ethers |
| PCBs | Polychlorinated Biphenyls |
| PDF | Portable Document Format |
| PEC-Q | Probable Effect Concentration Quotient |
| QA | Quality Assurance |
| QAPP | Quality Assurance Project Plan |
| QA/QC | Quality Assurance/Quality Control |
| RAP | Remedial Action Plan |
| R-EMAP | Regional Environmental Monitoring and Assessment Program |
| RPD | Relative Percent Difference |
| RSD | Relative Standard Deviation |
| SADA | Spatial Analysis and Decision Assistance |
| SEM | Simultaneously Extractable Metals |
| SQG | Sediment Quality Guideline |
| SQT | Sediment Quality Target |
| SRM | Standard Reference Material |
| TCDD | Tetrachlorodibenzo-p-dioxin |
| TCDF | Tetrachlorodibenzo-p-furan |
| TEF | Toxic Equivalency Factor |
| TMDL | Total Maximum Daily Load |
| TOC | Total Organic Carbon |
| TVS | Total Volatile Solids |
| U.S. | United States |
| USACOE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |
| USS | United States Steel |
| UTM | Universal Transverse Mercator |
| VOCs | Volatile Organic Compounds |
| WDNR | Wisconsin Department of Natural Resources |
| WHO | World Health Organization |
| WI | Wisconsin |

# A PROJECT MANAGEMENT

## A1 PROJECT/TASK ORGANIZATION

### A1.1 Purpose/Background

The U.S. Environmental Protection Agency's (EPA) Great Lakes National Program Office (GLNPO) has extended a grant to the Duluth office of the Minnesota Pollution Control Agency (MPCA) to develop a comprehensive sediment management plan for the lower St. Louis River Area of Concern (AOC). As one component of this project, Phase II of a geographic information system (GIS)-based sediment quality database for the St. Louis River AOC will be initiated. The Phase I GIS-based database, funded through GLNPO grant number GL97536301-1, was completed September 30, 2003 (Smorong and Crane, 2003; Smorong *et al*., 2003a,b). The Phase I project followed the quality assurance/quality control (QA/QC) procedures provided in the Phase I Quality Assurance Project Plan (QAPP; Crane 2001). To ensure continuity in the Phase II project, the same consulting group that worked on the Phase I project [i.e., MacDonald Environmental Sciences Ltd. (MESL)] will work on this project.

This document provides an update of the Phase I QAPP to meet the goals of the Phase II GIS-based sediment quality database. As part of the Phase II QAPP, a detailed work plan for this project is given in Section B. Since the amount of funds available for this task is inadequate to complete the GIS-based sediment quality database, additional funds are being sought by the Environmental Outcomes Division of the MPCA to complete it. A separate QAPP will be developed by Brian Fredrickson (MPCA Grant Manager) for the other work components of the comprehensive sediment management plan, including a compilation of loading sources, compilation of recommendations from related studies with applications to sediment management topics, identification of historical point sources, and development and implementation of an overall public participation strategy.

The various quality assurance and management responsibilities of key project personnel are defined in the following section.

### A1.2 Roles and Responsibilities

The overall lines of authority for this specific project can be found in Figure A-1. This chart includes all of the individuals discussed in the following subsections. The MPCA Project Manager will have overall responsibility for managing the Phase II GIS-based sediment quality database.

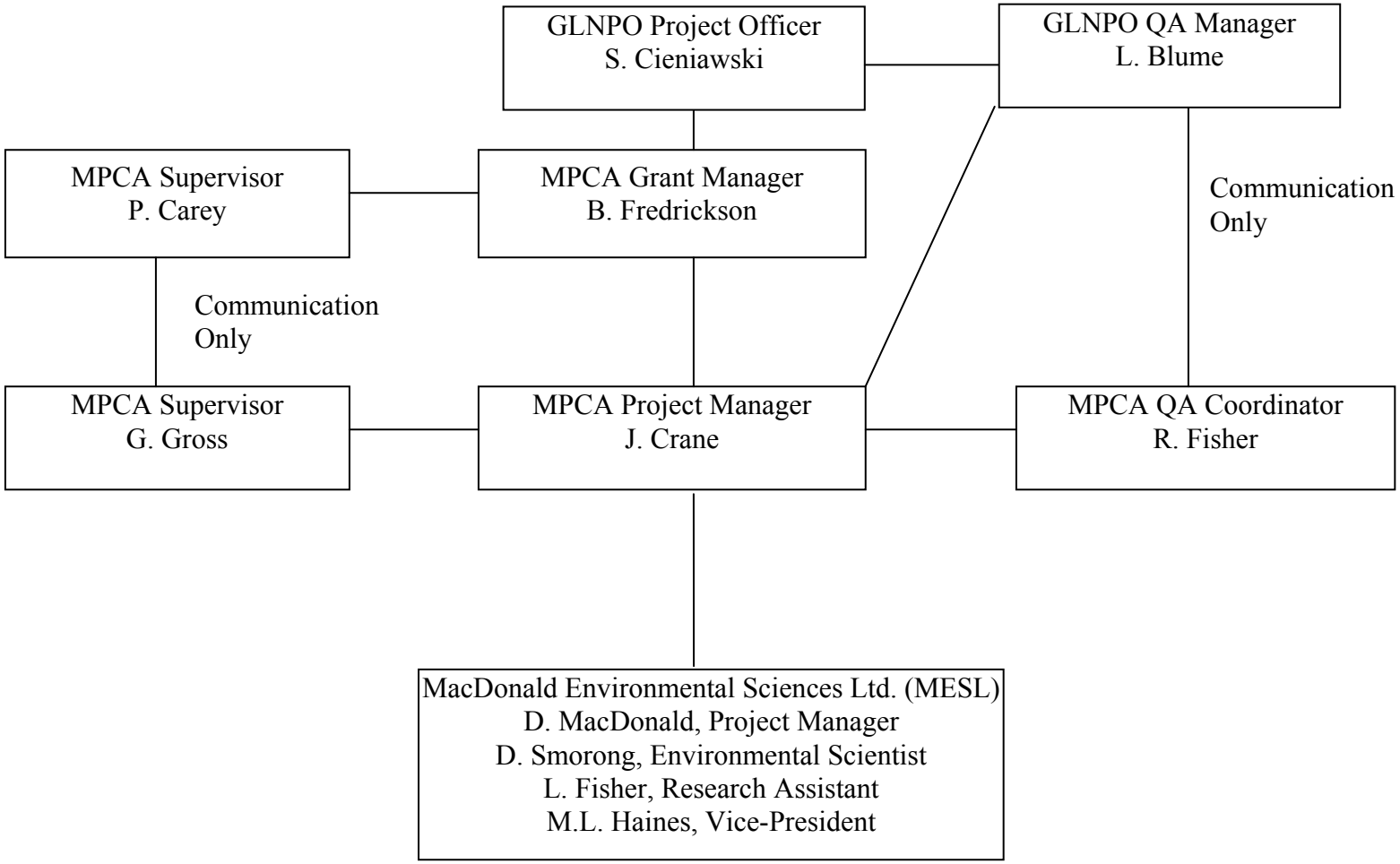


Figure A-1. General project organization chart.

### A1.2.1 MPCA Personnel

The Agency Grant Coordinator for the MPCA has developed a detailed list of the roles and responsibilities of staff involved in administering agency grants (Appendix A). This section will only include those staff who are directly involved in the technical work tasks of this project.

The MPCA staff associated with this project in the Environmental Outcomes Division can be reached at the following address:

Environmental Outcomes Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194
General Phone: 1-800-657-3864
Fax: 651-297-7709

The MPCA staff associated with this project in the Regional Environmental Management Division can be reached at the following address:

Regional Environmental Management Division
Minnesota Pollution Control Agency
525 Lake Avenue South, Suite 400
Duluth, MN 55802
General Phone: 218-723-4660
Fax: 218-723-4727

| ***Person:*** | ***Responsibilities:*** |
|---|---|
| Judy Crane, Project Manager<br>Water Standards Unit<br>Environmental Standards & Analysis Section<br>Phone: 651-297-4068<br>Email: judy.crane@pca.state.mn.us | Prepare single-source contract to MESL<br>Develop work plan and QAPP<br>Coordinate the collection of sediment quality and GIS data from government, tribal, nonprofit, and business sources<br>Prepare quarterly progress reports to Grant Manager<br>Oversee and approve consultant work products<br>Distribute GIS-based sediment quality database to MPCA staff and stakeholders<br>Give presentations on the GIS-based database to interested users<br>Perform project management tasks |

| ***Person:*** | ***Responsibilities:*** |
|---|---|
| Brian Fredrickson, Grant Manager<br>Community and Area Wide Programs Unit<br>Northeast Region Section<br>Regional Environmental Management Division<br>Phone: 218-723-4663<br>Email: brian.fredrickson@pca.state.mn.us | Responsible for maintaining communication with GLNPO Project Officer and MPCA Project Manager<br>Responsible for grant requirements and special conditions being met<br>Responsible for maintaining fiscal integrity of grant program<br>Review and approve QAPP |
| Greg Gross, Supervisor<br>Water Standards Unit<br>Environmental Standards & Analysis Section<br>Environmental Outcomes Division<br>Phone: 651-296-7442<br>Email: greg.gross@pca.state.mn.us | Supervise Project Manager<br>Approve contract for technical services<br>Approve QAPP<br>Creates, with staff, the unit and individual work plans<br>Ensures that grant funds for the GIS-based database portion of the grant are only used for grant-specific work<br>Reviews grant progress reports for the GIS-based database portion of the grant |
| Pat Carey, Supervisor<br>Community and Area Wide Unit<br>Northeast Region Section<br>Regional Environmental Management Division<br>Phone: 218-723-4744<br>Email: patrick.carey@pca.state.mn.us | Supervise Grant Manager<br>Approve QAPP<br>Creates, with staff, the unit and individual work plans<br>Ensures that grant funds for the entire grant are only used for grant-specific work<br>Reviews all grant progress reports |
| Roger Fisher, QA Coordinator<br>Rivers and Streams Monitoring Unit<br>Monitoring & Reporting Section<br>Environmental Outcomes Division<br>Phone: 651-296-7387<br>Email: roger.fisher@pca.state.mn.us | Review and approve QAPP<br>Respond to QA/QC questions |

### A1.2.2 GLNPO Personnel

The GLNPO staff associated with this project are as follows:

| ***Person:*** | ***Responsibilities:*** |
|---|---|
| Scott Cieniawski, Project Officer<br>U.S. EPA GLNPO<br>17G<br>77 West Jackson Boulevard<br>Chicago, IL 60604<br>Phone: 312-353-9184<br>Fax: 312-353-2018<br>Email: cieniawski.scott@epamail.epa.gov | Coordinate grant requests<br>Review work plan and QAPP<br>Provide technical assistance, as needed<br>Review quarterly progress reports<br>Review draft and final copies of Phase II GIS- based sediment quality database |
| Louis Blume, QA Officer<br>Same address as S. Cieniawski<br>Phone: 312-353-2317<br>Fax: 312-353-2018<br>Email: blume.louis@epamail.epa.gov | Review and approve QAPP<br>Provide technical assistance for QA/QC questions |

### A1.2.3 Consultant

MacDonald Environmental Sciences Ltd. (MESL) is the MPCA's consultant for this project. Any corrective actions to the Phase II GIS-based sediment quality database will be reported to the MPCA Project Manager. Project personnel at MESL may be contacted by the MPCA Project Manager, MPCA Grant Manager, GLNPO Project Officer, GLNPO QA Officer, or MPCA QA Coordinator at any time to discuss QA/QC concerns.

Staff from MESL will be responsible for the following deliverables:

- One master set of compact disks (CDs) of the Phase II GIS-based sediment quality database [in Microsoft™ (MS™) Access '97 and 2000 formats, as well as in a MS™ Access 2000 database formatted to be compatible with Query Manager 2.5 software], which contain all sediment quality data sets designated by the MPCA Project Manager;
- One master set of CDs of the updated ArcView 3.2 and 8.3 projects;
- One electronic copy each of the updated technical documentation and Help Sections for the database and GIS components of this project; and,
- One electronic copy of the technical memorandum of the updated comparison of mean probable effect concentration quotients (PEC-Qs) for surficial sediments in the St. Louis River AOC with mean PEC-Qs for other freshwater sites in the Great Lakes region and in North America.

The MESL staff associated with this project can be reached at the following address:

MacDonald Environmental Sciences Ltd.
#24 – 4800 Island Highway North
Nanaimo, British Columbia V9T 1W6, Canada
General Phone: 250-729-9625
Fax: 250-729-9628
Email: mesl@island.net

| ***Person:*** | ***Responsibilities:*** |
|---|---|
| Donald MacDonald, Project Manager<br>Phone: 250-729-9623 | Maintain regular communication with MPCA Project Manager regarding project status, issues, and concerns<br>Oversee the development and completion of all project deliverables to the MPCA<br>Provide quarterly progress reports to Project Manager |
| Dawn Smorong, Environmental Scientist<br>Phone: 250-729-9625 | Provide project coordination with MPCA Project Manager and NOAA staff/contractors<br>Determine the availability of new GIS watershed data, and update the ArcView 3.2 projects with these data sets<br>Convert the ArcView 3.2 projects to ArcView 8.3<br>Update the MS™ Access 2000 database with new data fields, as needed<br>Screen reports for database<br>Populate the database with available sediment quality data<br>Conduct QA/QC checks of the database<br>Save the MS™ Access 2000 database in MS™ Access '97 format<br>Translate the MS™ Access 2000 database to format compatible with Query Manager 2.5 software<br>Coordinate updates of the Help Sections for database and ArcView users, as well as technical documentation of the GIS-based database |

| ***Person:*** | ***Responsibilities:*** |
|---|---|
| Dawn Smorong, Environmental Scientist<br>Phone: 250-729-9625 | Provide comparisons of the mean PEC-Qs for surficial sediments in the St. Louis River AOC with mean PEC-Qs for other freshwater sites in the Great Lakes region and in North America |
| Leanne Fisher, Research Assistant<br>Phone: 250-729-9625 | Assist with screening and populating the database with available sediment quality data and Wisconsin sediment quality guideline (SQG) values<br>Conduct QA/QC checks of the database<br>Assist with updating the Help Sections for database and ArcView users, as well as technical documentation of the GIS-based database<br>Provide comparisons of the mean PEC-Qs for matching sediment chemistry and toxicity data from the St. Louis River AOC with other sites in the Great Lakes area and in North America |
| Mary Lou Haines, Vice President<br>Phone: 250-729-9625 | Oversee the preparation of invoices, reports, and other business operations of MESL |

# A2 PROBLEM DEFINITION/BACKGROUND

## A2.1 Purpose/Background

The St. Louis River estuary has been, and continues to be, of vital economic, environmental, and social importance to the area encompassing Cloquet, MN; Duluth, MN; and Superior, WI (Figure A-2). The middle and lower portions of the estuary support a variety of industrial, residential, and recreational activities. In addition, these areas provide essential habitats for aquatic organisms (e.g., walleye) and aquatic-dependent wildlife species (e.g., bald eagles). The lower estuary culminates in the Duluth-Superior Harbor, which is one of the most heavily used ports in the Great Lakes basin. Historic and ongoing land use and water-related activities in the middle and lower portions of the estuary have contributed a variety of nutrients and chemicals to the St. Louis River.

In 1987, concerns over environmental quality conditions prompted the designation of the lower St. Louis River (i.e., from Cloquet, MN to its entrance to Lake Superior) as one of 43 Great Lakes AOCs (IJC, 1989). Remedial Action Plans (RAPs) have been established as the principal mechanism for addressing concerns related to impaired uses in the most severely impacted geographic areas in the Great Lakes basin (i.e., AOCs). Specifically, the terms of the Great Lakes Water Quality Agreement necessitate the preparation of RAPs for each AOC. The RAPs are being prepared in a staged approach, including:

- Stage I – Identify and assess use impairments, and identify the sources of the stresses from all media in the AOC;
- Stage II – Identify proposed remediation actions and their method of implementation; and,
- Stage III – Document evidence that impaired uses have been restored.

Importantly, the RAP process must embody a comprehensive ecosystem approach and include substantial citizen participation (MPCA and WDNR, 1992). The International Joint Commission (IJC), through a formal protocol agreement between Canada and the United States, was charged with reviewing the RAPs for each AOC and assuring that they met these basic criteria. To facilitate effective citizen participation, the St. Louis River Citizen Advisory Committee became the independent, nonprofit Citizens Action Committee (CAC) in 1997. The CAC has played an essential role in the further development and implementation of the RAP process.

To support environmental quality assessments, the IJC developed a set of criteria for evaluating use impairments at Great Lakes AOCs. As part of the Stage I RAP, the existing information on environmental conditions in the St. Louis River was assembled and compared to the IJC's fourteen impaired use categories. The results of this assessment indicated that at least nine use impairments had occurred in the St. Louis River AOC (MPCA and WDNR, 1992). Additionally, two possible impairments were indicated; however, additional data were needed

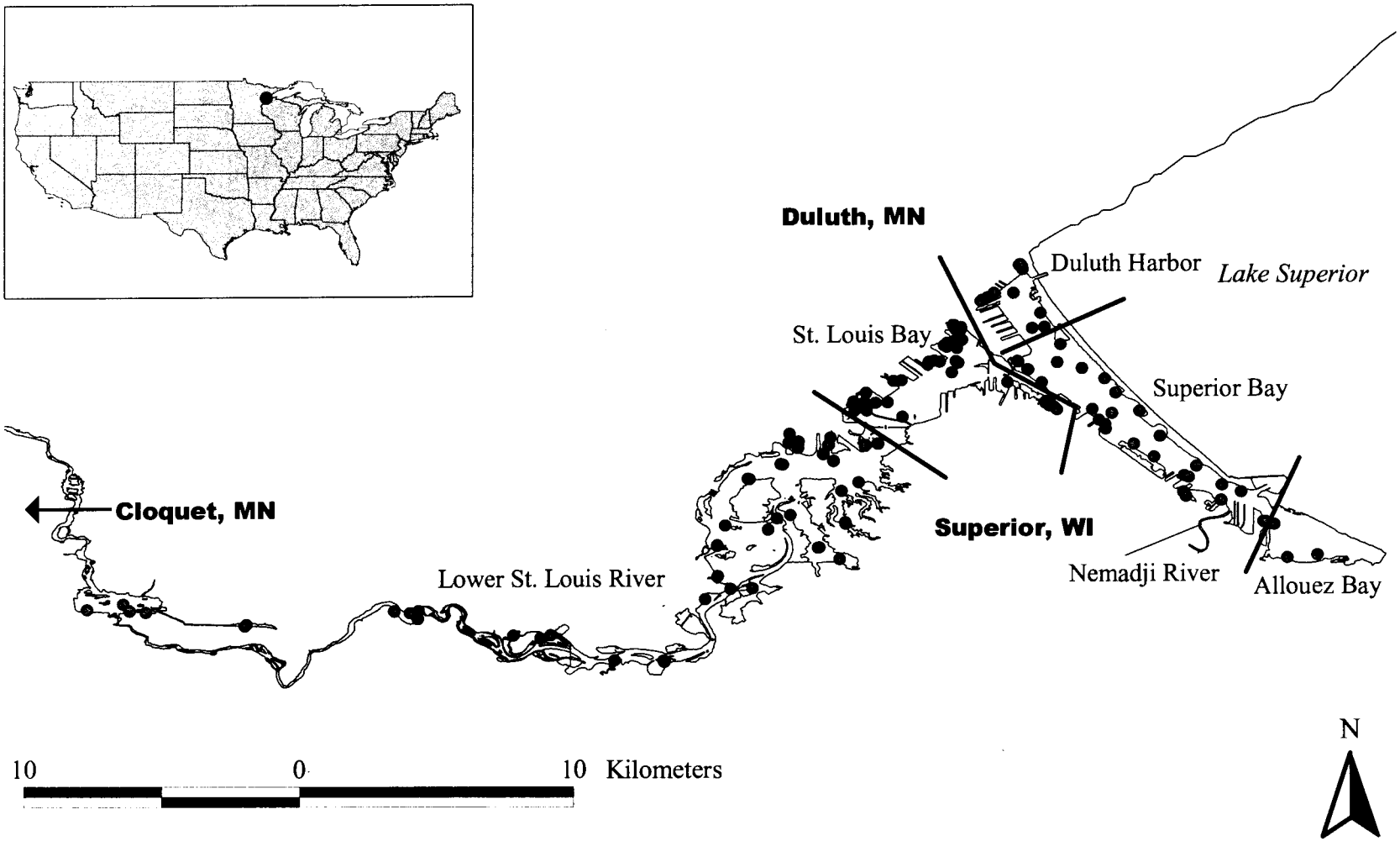


Figure A-2. Map of the St. Louis River AOC showing the location of sediment sampling sites included in a matching sediment chemistry and toxicity database for this AOC (Crane *et al.*, 2000). Major water body boundaries are designated on the map.

to confirm their presence in the AOC (MPCA and WDNR, 1992). Many of the confirmed impairments were associated with sediment contamination in the St. Louis River watershed, including effects on sediment-dwelling organisms and other aquatic species, fish consumption advisories, and restrictions on navigational dredging activities. A number of ecosystem health indicators have been selected to support the assessment of sediment quality conditions within this AOC, including sediment chemistry, sediment toxicity, benthic invertebrate community structure, tissue chemistry, physical characteristics of sediments, and biomarkers in fish. Investigations conducted using data on multiple indicators provide a weight-of-evidence approach for assessing the effects of contaminated sediments on the beneficial uses of this aquatic ecosystem.

## A2.2 Problem Statement and Background

### A2.2.1 Introduction

As part of the RAP process for the St. Louis River AOC, the MPCA and Wisconsin Department of Natural Resources (WDNR), along with citizen and technical stakeholders, identified the need to compile sediment quality data collected from the St. Louis River AOC in a database format. As a first step, the Arrowhead Regional Development Commission (ARDC) developed a sediment quality database in 1990 that included all available sediment quality data (31 studies) from the early 1970s to 1990 (MPCA and WDNR, 1995). The sources of these studies included the U.S. Army Corps of Engineers, U.S. EPA, Minnesota and Wisconsin state agencies, contractors, and university researchers. However, no attempt was made to evaluate QA/QC procedures in these studies due to a lack of resources. In addition, accurate locational information was not available for most of these sampling stations so the data could not be plotted on maps based on GIS software.

In October 2000, the MPCA obtained a grant from GLNPO (GL97536301-1) to develop a GIS-based sediment quality database for the St. Louis River AOC. MESL was retained in April 2001 to assist the MPCA with this effort. A QAPP was completed and approved by GLNPO in July 2001 (Crane, 2001) so that work could commence on the project. In October 2001, MESL and MPCA staff met with over 60 stakeholders in Duluth and St. Paul to obtain their input on the development of this GIS-based database. Stakeholders were asked to identify priority sediment quality indicators, sources of candidate data sets, and key types of GIS data for the St. Louis River watershed (MacDonald *et al*., 2001). Their input was very useful in producing what should be considered as Phase I of the GIS-based sediment quality database. Staff from the National Oceanic and Atmospheric Administration (NOAA) provided no-cost technical assistance to translate the Phase I MS™ Access 2000 database into their free Query Manager 2.5 software, which has a number of user friendly query options and is compatible with ArcView 3.2 and NOAA's free MARPLOT (i.e., spatial mapping) software. Near the completion of this grant, the MPCA Project Manager and MESL Environmental Scientist provided overview presentations of the project to MPCA staff and stakeholders in Duluth and

St. Paul, MN. In addition, more detailed training of the Phase I GIS-based sediment quality database was offered to them. MPCA staff and stakeholders expressed a great desire to keep this project going so that additional sediment quality and GIS-watershed data sets could be added to the project. In addition, several stakeholders expressed a need to add benthic invertebrate community data to the database.

The Phase I MS™ Access 2000 database was populated with sediment quality data from 20 of 37 known studies conducted throughout the AOC since 1990 (Table A-1). The Phase I database includes analytical chemistry results for 423 surficial sediment samples and 658 subsurface sediment samples, sediment toxicity results for 303 surficial sediment samples, sediment bioaccumulation test results for 6 surficial sediment samples, and fish tissue residue results for 39 samples. Benthic invertebrate community data were not added to the Phase I database due to a lack of resources. In addition, a wide variety of GIS-watershed data have been compiled in 10 ArcView 3.2 projects for the following categories: contaminated areas, ecological areas, geographic features, hydrology, land use, recreation, U.S. EPA Inland Sensitivity Atlas, water quality, water use, and a black and white base map (Appendix B; see Figures A-3 and A-4 for examples). All of the data sources represented in these ten projects are in the UTM Zone 15 NAD 83 map projection. The ArcView projects also include aerial photographs and scanned U.S. Geological Survey topographic maps.

### A2.2.2 Site Description

The St. Louis River is the second largest tributary to Lake Superior. The boundaries of the AOC include 72 nautical kilometers from Cloquet, MN to the Duluth and Superior entries to Lake Superior (Figure A-2). Along much of its length, the St. Louis River flows through a landscape that is dominated by northern boreal forests. Upstream of the AOC boundaries, the river channel is characterized by shallow meanders and sandy gravel bars. Near Cloquet, MN, the character of the river changes abruptly as it starts its steep descent to Lake Superior (Fredrickson, 1998). This portion of the watershed is characterized by deeply incised river channels and canyons. Five dams have been constructed on this reach of the river to take advantage of the hydroelectric power generation potential associated with the increased river gradient. These dams have resulted in the creation of six reservoirs downstream of Cloquet, including the Knife Falls, Potlatch, Scanlon, Thomson, Forbay, and Fond du Lac Reservoirs. While these reservoirs are relatively small and have limited water storage capacities, the flow and water level in the river downstream of the reservoirs are significantly affected by water releases from these facilities (MPCA and WDNR, 1992).

As the river approaches Lake Superior, the current dissipates and the water body takes on the character of a lake (Fredrickson, 1998). The St. Louis River estuary, which covers an area of approximately 12,000 acres, is comprised of numerous large bays, peninsulas, and islands. Some of the important natural features in the estuary include Spirit Lake, Pokegama Bay, Kimball's Bay, St. Louis Bay, Duluth Harbor, Superior Bay, and Allouez Bay. Together, these

Table A-1. Summary of Data Sets Incorporated in the GIS-Based Sediment Quality Database for the St. Louis River AOC (Smorong *et al.*, 2003b)

| Reference | Location | Sediment Chemistry | Toxicity Test Data | Benthic Data* | Bioaccu-mulation Data | Sampling Years | Total Number of Samples |
|---|---|---|---|---|---|---|---|
| Ankley *et al.* (1994)** | Duluth-Superior Harbor | PAHs, TOC | Yes | No | No | 1994 | 5 |
| AScI Corporation (1999) | Duluth-Superior Harbor | Hg, PAHs, PCBs, TOC (Tissue - Hg, PAHs, PCBs) | Yes | No | Yes | 1999 | 17 |
| Crane (1999) | Slip C, Duluth Harbor | Hg, Pb, PAHs, PCBs, TOC, Particle Size | No | No | No | 1997 | 51 |
| Crane *et al.* (2002) | Minnesota Slip, Duluth Harbor | Metals, Hg, PAHs, PCBs, AVS, SEM, TOC, Particle Size | Yes | No | No | 1999 | 103 |
| Crane *et al.* (1997) | Duluth-Superior Harbor | SEM Metals, AVS, As, Pb, Hg, TCDDs, TCDFs, PAHs, PCBs, Ammonia, TOC, Particle Size | Yes | Yes | No | 1994 | 224 |
| ENSR (1996) | Upper St. Louis River; Thomson and Forbay Reservoirs | Hg, Methyl Hg | No | No | No | 1995 | 56 |
| IT Corporation (1997)** | Interlake/Duluth Tar Superfund Site | SEM Metals, AVS, PAHs, TOC, Metals, Hg, Ammonia, Particle Size | Yes | Yes | No | 1996 | 16 |
| King (2001) | Lower St. Louis River Estuary | Total chlorinated bornanes/bornenes, cis- and trans-chlordane, cis- and trans-nonachlor | No | No | No | 1999 | 44 |

Table A-1. Continued

| Reference | Location | Sediment Chemistry | Toxicity Test Data | Benthic Data* | Bioaccu-mulation Data | Sampling Years | Total Number of Samples |
|---|---|---|---|---|---|---|---|
| MPCA (unpublished data); Crane (1997)** | USX and Interlake/Duluth Tar Superfund Sites | Metals, Hg, PAHs, Cyanide, TOC, Phenol | Yes | No | No | 1993 | 4 |
| MPCA (1997a); Breneman *et al*. (2000); Richards *et al*. (2004); USEPA (In prep.) | St. Louis River AOC | SEM Metals, AVS, Hg, PAHs, TOC, Particle Size | Yes | Yes | No | 1995 | 165 |
| MPCA (1997b) | St. Louis River AOC | SEM Metals, AVS, Hg, PAHs, TOC, Particle Size | Yes | Yes | No | 1996 | 34 |
| MPCA (unpublished data) | Minnesota Slip, Duluth Harbor | Hg, Pb, PAHs, TOC | No | No | No | 1998 | 9 |
| MPCA (unpublished data) | Dakota Pier Boat Slip, Duluth Harbor | Metals, Hg, PAHs, Ammonia, Cyanide, Sulfate, TOC | No | No | No | 1999 | 8 |
| MPCA (unpublished data) | Vicinity of WLSSD and Forbay Reservoir | Toxaphene | No | No | No | 1996 | 10 |
| Oliaei *et al*. (2002)*** | Vicinity of WLSSD | PBDEs, TOC | No | No | Yes (fish tissue) | 2001 | 1 |
| Schubauer-Berigan and Crane (1996) | Thomson, Forbay, Fond du Lac Reservoirs | Hg, PCBs, TCDD | Yes | No | Yes (fish tissue) | 1992, 1993 | 217 |

Table A-1. Continued

| Reference | Location | Sediment Chemistry | Toxicity Test Data | Benthic Data* | Bioaccu-mulation Data | Sampling Years | Total Number of Samples |
|---|---|---|---|---|---|---|---|
| Schubauer-Berigan and Crane (1997) | Duluth-Superior Harbor | Metals, Hg, PAHs, PCBs, TCDDs, TCDFs, Pesticides, Ammonia, TOC | Yes | No | No | 1993 | 210 |
| Smith *et al.* (1992)** | Allouez Bay, WLSSD, others | Metals, total PCB, total PAH, Particle size | Yes | No | Yes (fish tissue) | 1992 | 5 |
| URS Corporation (2002) | USS Superfund Site | Metals, Cyanide, Percent solids | No | No | No | 2002 | 20 |
| Wenck Associates (1995)** | Lakehead Pipe Line (North of Hog Island Inlet) | Metals, Hg, DROs, PAHs, Oil & Grease, Ammonia, TOC, Percent Solids | Yes | No | No | 1995 | 2 |

* Benthic invertebrate community data were not incorporated into the Phase I GIS-based sediment quality database due to a lack of resources.
** Only matching sediment chemistry and toxicity data from this study were included in the Phase I GIS-based sediment quality database.
*** Fish tissue data were not incorporated into the Phase I GIS-based sediment quality database due to a lack of resources.

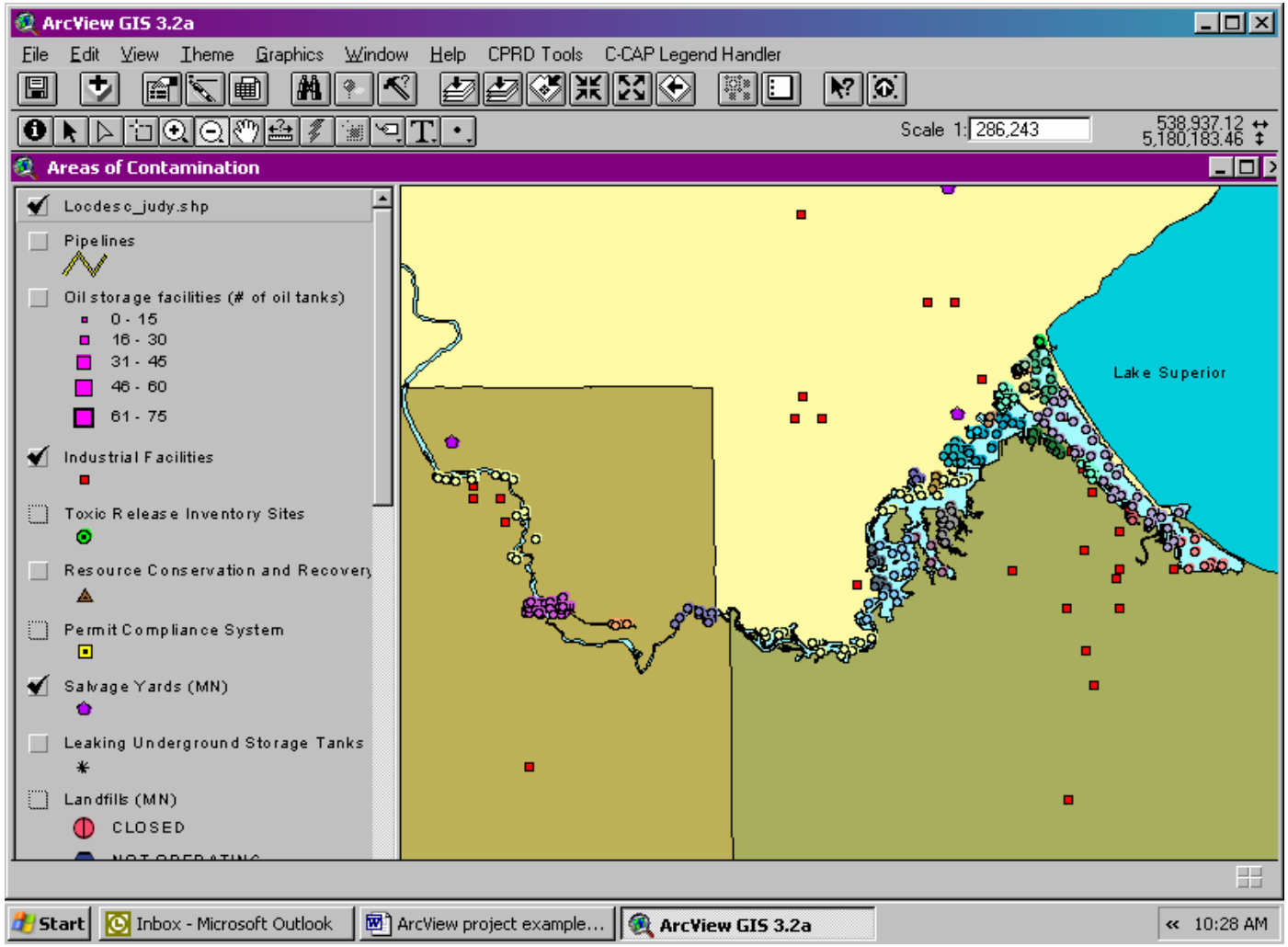


Figure A-3. Location of sediment sampling sites included in the Phase I MS™ Access 2000 database. The locations of industrial facilities and salvage yards are also indicated.

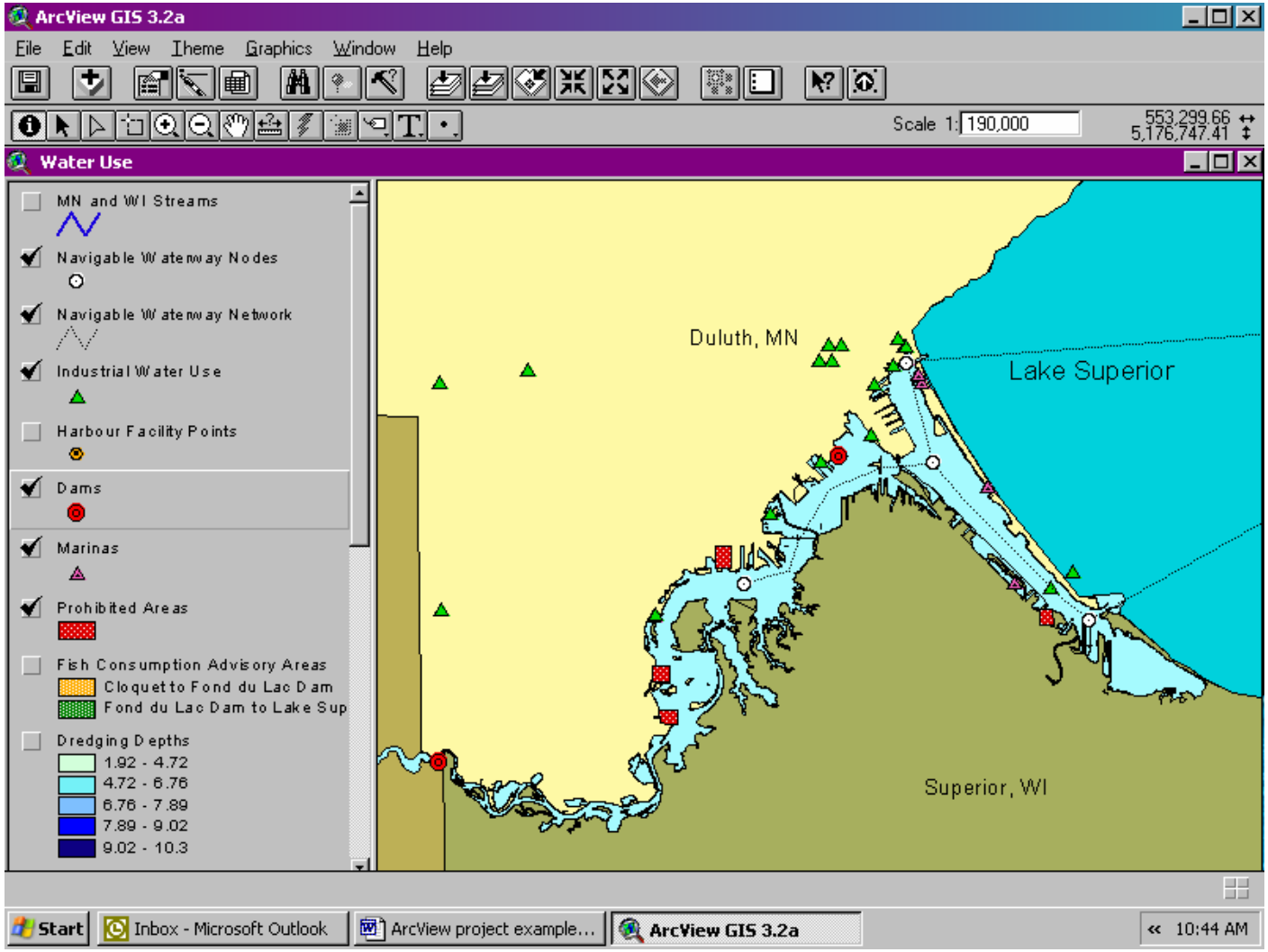


Figure A-4. Example of water uses in the St. Louis River AOC.

areas support a wide variety of important fish, aquatic invertebrate, avian, and other aquatic-dependent wildlife species (St. Louis River CAC, 2002). Just prior to entering Lake Superior at the Duluth Ship Canal and at the Superior Entry, the river forms a large embayment which is protected by two long sandbars (i.e., Minnesota and Wisconsin Points). These sandbars form the longest natural freshwater sandbars in the world. Two inner spits, Rices Point and Conners Point, divide the port into inner and outer harbors. This unique geomorphology has created a natural harbor which has been dredged and modified since the mid-1800s to accommodate shipping traffic and commerce (Walker and Hall, 1976). The Duluth-Superior Harbor waterfront is currently 79 km long, with 27 km of dredged channels (Duluth Seaway Port Authority Web Site: http://www.duluthport.com/seawayfactsmetric.html).

The Duluth-Superior Harbor is one of the largest inland seaports in the world and the most heavily used port in the Great Lakes basin. Total waterborne commerce in 2002 through the Port of Duluth-Superior reached 39.5 million metric tons, of which the principal cargoes were iron ore (42.5%), coal (41.6%), and grain (8.3%) (Duluth Seaway Port Authority Web Site: http://www.duluthport.com/tonnagestats/2002/yearend-2002-tonnage.html). For 2002, a total of 1,140 vessels arrived in the port, including 150 overseas vessels (http://www.duluthport.com/tonnagestats/2002/yearend-2002-tonnage.html). Historically, the storage and shipping of taconite, limestone, coal, and iron ore were conducted at various locations within the Duluth-Superior Harbor (Walker and Hall, 1976). Historic smelting and manufacturing operations along the harbor have resulted in the most contaminated sediment sites in the harbor today (i.e., the Interlake/Duluth Tar and USS Superfund sites).

### A2.2.3 Past Data Collection Activities

The sediment quality data assembled to support Stage I of the RAP, and those data collected thereafter, indicate that several areas in the St. Louis River AOC have been contaminated by a variety of chemicals. Most of these sediment quality studies have been conducted by state agencies (Minnesota and Wisconsin) and their consultants, as well as by potentially responsible parties, the U.S. Army Corps of Engineers and their contractors, and the Fond du Lac Band and their collaborators at the University of Minnesota-Duluth. Additional studies have been conducted by researchers at the U.S. EPA-Duluth, consultants for business within the St. Louis River AOC, and by other university researchers.

Sediment assessment projects in the reservoirs downstream of Cloquet, MN, and in the lower estuary, have been conducted to determine the spatial extent of contamination and to assess impacts to benthic biota and fish. The data that have been collected to support these assessments show that various contaminants occur in the reservoirs and lower estuary of the St. Louis River AOC. The most elevated contaminant found in the surficial sediments of the Thomson, Forbay, and Fond du Lac Reservoirs is mercury (Glass *et al.*, 1990, 1998; Schubauer-Berigan and Crane, 1996), while elevated levels of polychlorinated biphenyls (PCBs) and 2,3,7,8-TCDD (dioxin)

have been found in deeper sections of sediment cores from these reservoirs (Schubauer-Berigan and Crane, 1996).

Mercury and polycyclic aromatic hydrocarbons (PAHs) are widespread contaminants found in depositional areas of the lower St. Louis River estuary, whereas metals, PCBs, dioxins and furans, organochlorine pesticides, tributyltin, and diesel range organics (DROs) tend to be more localized contaminants (MPCA and WDNR, 1992; Schubauer-Berigan and Crane, 1997; Crane *et al.*, 1997; Breneman *et al*., 2000; Richards *et al*., 2004). The sediments with the highest contaminant concentrations occur at two Superfund sites (i.e., Interlake/Duluth Tar and USS) in the inner Duluth Harbor (Schubauer-Berigan and Crane, 1997; IT Corporation, 1997; Bay West, Inc., 2001; URS Corporation, 2002). Other areas with elevated contaminant concentrations in the Duluth-Superior Harbor include Hog Island Inlet/Newton Creek in Superior, WI (Redman and Janisch, 1995; SEH Inc., 2000, 2003a,b), as well as several boat slips (Crane, 1999; AScI Corporation, 1999; Crane *et al*., 2002), areas adjacent to wastewater treatment plants (Schubauer-Berigan and Crane, 1997; Crane *et al*., 1997), and other areas with historical sources of contaminants (Schubauer-Berigan and Crane, 1997; Crane *et al*., 1997). Action is currently being taken by the MPCA and WDNR to implement source control measures and to remediate contaminated sediments at several contaminated hot spot areas in the lower St. Louis River estuary.

Sediments from several hot spot sites in the AOC have been shown to be toxic to sediment-dwelling organisms and/or associated with alterations of benthic invertebrate community structure (Prater and Anderson, 1977; Ankley *et al*., 1994; Redman and Janisch, 1995; Wenck Associates, 1995; Schubauer-Berigan and Crane, 1996, 1997; Crane *et al*., 1997, 2002; IT Corporation, 1997; AScI Corporation 1999; Breneman *et al*., 2000; Richards *et al*., 2004). A broad-scale assessment of the relationship between surficial sediment characteristics and benthic community structure in the St. Louis River AOC was conducted in 1995 as part of a Regional Environmental Monitoring and Assessment Program (R-EMAP) project (Breneman *et al*., 2000; Richards *et al*., 2004). For the R-EMAP study, taxa richness was variable (i.e., 1 to 25 taxa) among randomly sampled sites within two habitat classes (i.e., <5.5 m and >5.5 m water depth). Oligochaetes were the most abundant taxa, whereas Chironomidae larvae provided a majority of the taxa richness with 43 genera. For the entire data set, the majority of variation in benthic community structure was attributed to water depth and distance from the headwaters (Breneman *et al.*, 2000).

Fish consumption advisories are in effect for selected fish species in the St. Louis River AOC because of elevated concentrations of mercury found in the tissues of the fish. Most of these advisories limit fish consumption to one meal per week for the protection of human health for sport fish (http://www.health.state.mn.us/divs/eh/fish/eating/rivergenpop.pdf); more restrictive advisories are in effect for women of child bearing age and young children (http://www.health.state.mn.us/divs/eh/fish/eating/riverspecpop.pdf). In addition, health advisories are also in effect for the consumption of certain size classes of channel catfish and

lake sturgeon due to elevated concentrations of PCBs found in the tissues of the fish (http://www.health.state.mn.us/divs/eh/fish/eating/rivergenpop.pdf).

Since the St. Louis River constitutes the second largest tributary to Lake Superior, the potential transport of sediment-associated contaminants to Lake Superior is of additional concern to many stakeholders. Based on a limited data set from a toxics loading study, King (1999) determined that dieldrin, ∑DDT, total PCBs, and several PAH compounds had a net flux out of the Duluth-Superior Harbor to Lake Superior.

The St. Louis River AOC also contains relatively clean areas that provide important fisheries and wildlife habitat. These clean sites also represent reference areas for determining contemporary background levels of anthropogenic contaminants in the lower estuary. Clean areas were identified in the past by comparing sediment chemistry data from sample sites to that from reference areas (such as remote lakes in northeast Minnesota). These data were also compared to Ontario's Lowest Effect Level SQGs (Persaud *et al.*, 1993). Numerical sediment quality targets (SQTs), recently adopted for use in the St. Louis River AOC, will now be used as the chemical benchmarks for assessing sediment chemistry data in the St. Louis River AOC (Crane *et al*., 2000). The Duluth-Superior Harbor shipping channels also contain substantial quantities of relatively clean materials that pass land-based application guidelines. Hence, dredged materials from the shipping channels are washed at the Erie Pier confined disposal facility (CDF) in Duluth, MN and the sand-sized particles are re-used for beach nourishment, habitat development, highway construction, and other beneficial uses [U.S. Army Corps of Engineers (USACOE), 1997].

### A2.2.4 Intended Data Usages

The purpose of the Phase II GIS-based sediment quality database is to support the assessment, preservation, and restoration of the lower St. Louis River AOC and adjoining Lake Superior ecosystems. The primary applications of the GIS-based database are to:

- Standardize the format of the existing data sets so the data are comparable and can be combined for the purposes of data analyses;
- Allow Agency staff and stakeholders to access sediment quality data;
- Allow Agency staff and stakeholders to view the data spatially, along with other GIS-related watershed data;
- Assist Agency staff and stakeholders with implementing the three-phase sediment strategy for the St. Louis River RAP;
- Assist Agency staff and stakeholders with developing a comprehensive sediment management plan for the lower St. Louis River AOC;
- Further the goals of the Lake Superior Lakewide Management Plan (LaMP) by tracking the occurrence of critical pollutants; and,

- Allow analysis of sediment contaminant information in conjunction with the detailed habitat evaluation and mapping accomplished through the St. Louis River Habitat Plan (St. Louis River CAC, 2002).

Other applications of the GIS-based database include: developing risk assessments at contaminated sediment sites, mapping contaminated sediment sites (pre- and post-remediation and pre- and post-navigational dredging), determining the status and trends of sediment indicators, comparing sediment chemistry data to SQT values, analyzing environmental data as part of the MPCA's Environmental Performance Partnership Agreement (EnPPA) requirements with the U.S. EPA, evaluating the economic and ecological benefits of sediment remediation, highlighting data gaps and possible new areas of contamination, and assisting with the development of total maximum daily loads (TMDLs) for mercury and other contaminants in the St. Louis River. The framework of this GIS-based sediment quality database will also serve as a model that can be used by participants at other Great Lakes AOCs.

The results of this project will be used to educate the St. Louis River CAC, as well as the Harbor Technical Advisory Committee of the Metropolitan Interstate Committee. CD-based ArcView projects will be expanded. This project will encourage public participation by providing a tool for the St. Louis River CAC; federal, state, and local government staff; the Fond du Lac Band; other nonprofit organizations; and businesses to use to engage citizens in discussions about sediment quality, habitat, land use, water use, and recreational uses within the St. Louis River AOC.

Once the Phase II GIS-based database has been completed, recipients of the Phase I GIS-based database will be notified. The availability of the Phase II GIS-based database will also be announced on the MPCA's Contaminated Sediment Web page. Additional updates of the GIS-based database will depend on securing outside funds to keep this project going.

## A3 PROJECT/TASK DESCRIPTION AND SCHEDULE

### A3.1 Purpose/Background

In order to move forward with the RAP process, continuation of the GIS-based sediment quality database is needed to integrate contaminated sediment, fisheries, and watershed data into an easily accessible format. The expansion of this database, and associated GIS-mapping component, will enhance implementation of the ecosystem-based management approach for assessing and remediating contaminated sediments in the St. Louis River AOC (Crane *et al.*, 2000).

The objectives of this project are to:

- Expand the MS™ Access 2000 sediment quality database for the St. Louis River AOC;

- Expand the ArcView projects to be used in conjunction with the database; and,
- Update other related work products that were initially prepared for the Phase I GIS-based database.

The design of the Phase I GIS-based sediment quality database was patterned after NOAA's Watershed databases, in which sediment chemistry, sediment toxicity, and tissue chemistry data have been compiled, and which can be viewed using NOAA's Query Manager software. A key component of this design is that each sample is georeferenced to facilitate spatial analyses of the underlying data and presentation of the information on appropriate base maps (i.e., in ArcView 3.2 projects). A detailed description of the database components included in the Phase I project is provided in Table A-2. This table includes a description of the structure and content of each database table, and a description of the information contained in each of the fields (columns) that comprise the tables.

The GIS-based sediment quality database is a relational database. This means that the database consists of several tables that can be linked together (i.e., relationships have been defined) to facilitate retrieval of the data in a wide variety of ways. The purpose of defining relationships is to coordinate the retrieval of information in the different tables. The main advantage of a relational database is that queries, forms, and reports can be created to display information from several tables at once. A relationship works by matching data in key fields (usually a field with the same name in both tables), and these matching fields provide a unique identifier for each data record. Figure A-5 shows the database relationships for the Phase I database. The key fields that are used to match the data in different tables, and thus provide a unique identifier, are the SITEID, STUDYID, STATIONID, SAMPLEID, FIELDREP, LABREP, AND CHEMCODE fields (Smorong and Crane, 2003; Smorong *et al*., 2003b). These fields were designed to be consistent with fields used in NOAA's Query Manager software.

A large number of GIS-watershed data sets were screened for the Phase I project, according to the following criteria (Smorong *et al.*, 2003a,b):

- The reliability of the data source was assessed;
- The date the data set was generated was determined, and more recently collected data were preferentially selected; and,
- The general quality of the data was assessed and only data sets of high quality (i.e., shapefiles) were included in the ArcView 3.2 projects.

The Phase I GIS-watershed data included in the ten ArcView 3.2 projects are listed and described in Appendix B (Smorong *et al*., 2003a,b). Each table provides a summary of the GIS data included in each of the ArcView 3.2 projects. In addition, these tables provide important information about each individual data set, such as details about the data source, how the data were accessed, any errors or problems that have been identified, and where the data and associated metadata are located on the Phase I project CDs.

Table A-2. Detailed Description of Database Components (Smorong *et al.*, 2003b)

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **lkp - CHEMDICT** | **NA** | **NA** | **Chemical dictionary (only included chemicals represented in the ptbl - CHEM table).** |
| CHEMCODE | Text | 10 | Chemical code (defined in lkp - chemdict). |
| CHEMNAME | Text | 45 | Chemical name. |
| CHEMCLASS | Text | 8 | Class of chemical. |
| CATEGORY | Text | 8 | Query Manager field (not populated). |
| SUBCATGY | Text | 10 | Query Manager field (not populated). |
| CHEMTOTAL | Text | 10 | Query Manager field (not populated). |
| MOLWT | Number | 8 | Molecular weight of chemical. |
| CASNUM | Text | 24 | Chemical abstract services number. |
| UNITS | Text | 6 | Units of chemical concentration. |
| WA_UNITS | Text | 6 | Query Manager field (not populated). |
| EDITDATE2 | Text | 8 | Query Manager field (not populated). |
| EDITBY | Text | 15 | Query Manager field (not populated). |
| EDITDATE | Date/Time | 8 | Query Manager field (not populated). |
| MESL_synonym | Text | 150 | Synonym for chemical name. |
| MESL_syn2 | Text | 150 | Synonym for chemical name. |
| MESL_syn3 | Text | 150 | Synonym for chemical name. |
| MESL_casno | Text | 50 | Chemical abstract services number (MESL version). |
| MESL_update | Text | 50 | Indicates if the record has been updated from the original NOAA Query Manager CHEMDICT file. |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **lkp - QUALIFY** | **NA** | **NA** | **Lookup table for sediment chemistry qualifiers (QUALCODE).** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| QUALCODE | Text | 5 | Qualifier code for concentration value, modified to be compatible with Query Manager (all ND data has a "U" in this field). |
| QUALIFIERS | Text | 30 | Qualifier code for concentration value, as designated in report. |
| DESCRIPT | Text | 80 | Description of the meaning of the qualifier, as indicated in the original report or data file. |
| MESL_LIBNO | Text | 50 | MESL - library number. |
| **lkp - SPECIES** | **NA** | **NA** | **Lookup table for tissue samples species type (SPP).** |
| SPP | Text | 5 | Species code. |
| COMMONNAME | Text | 25 | Common name. |
| SCIENTIFIC | Text | 40 | Scientific name. |
| GROUP | Text | 25 | Query Manager field (not populated). |
| EDITDATE2 | Text | 8 | Query Manager field (not populated). |
| EDITBY | Text | 15 | Query Manager field (not populated). |
| EDITDATE | Date/Time | 8 | Query Manager field (not populated). |
| MESL_COMMENT | Text | 50 | MESL - comments. |
| **lkp - SQC** | **NA** | **NA** | **Sediment Quality Criteria: Level I and Level II SQTs (Crane *et al.*, 2000).** |
| SQCCODE | Text | 10 | Code for Sediment Quality Criteria (see lkp - Sqcdict for a description of the codes). |
| CHEMCODE | Text | 10 | Chemical code (defined in lkp - chemdict). |
| CONC | Number | 8 | Chemical concentration. |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **lkp – SQC (cont.)** | | | |
| UNITS | Text | 6 | Units of SQC is reported in. |
| NORM | Text | 2 | Indicates measurement basis SQC are reported in. |
| MESL_chemical name | Text | 50 | MESL - chemical name. |
| MESL_units | Text | 50 | MESL - units. |
| MESL_comment | Text | 100 | MESL - comments. |
| **lkp - Sqcdict** | **NA** | **NA** | **Lookup table for Sediment Quality Criteria references (SQCCODE).** |
| SQCCODE | Text | 10 | Code for Sediment Quality Criteria. |
| SQCDESCR | Text | 90 | Description of the SQCCODE. |
| YEAR | Text | 4 | Year of publishing for study reporting the sediment quality criteria. |
| AUTHORS | Text | 160 | Authors for study reporting the sediment quality criteria. |
| TITLE | Text | 160 | Title of the study reporting the sediment quality criteria. |
| SOURCE | Text | 160 | Source (location) for study reporting the sediment quality criteria. |
| COMMENT | Text | 160 | Comments. |
| **lkp - SQCPAIRS** | **NA** | **NA** | **Lookup table for identifying Sediment Quality Criteria pairs.** |
| PAIRNAME | Text | 50 | High and low Sediment Quality Criteria (how Query Manager will reference the pair). |
| SQCLOW | Text | 10 | SQCCODE of low Sediment Quality Criteria. |
| SQCHIGH | Text | 10 | SQCCODE of high Sediment Quality Criteria. |
| LOW_NAME | Text | 8 | Low Sediment Quality Criteria (how Query Manager will reference the SQC). |
| HIGH_NAME | Text | 8 | High Sediment Quality Criteria (how Query Manager will reference the SQC). |
| SORT_ORDER | Number | 2 | Query Manager field (did not populate). |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **lkp - TESTDICT** | **NA** | **NA** | **Lookup table for toxicity test dictionary (TESTID).** |
| TESTID | Text | 12 | Code describing the bioassay. |
| MEDIUM | Text | 15 | Medium used in toxicity test (e.g., bulk sediment or pore water). |
| MEDCODE | Text | 2 | Code used to indicate medium used in toxicity test. |
| GROUP | Text | 20 | Group of organism used in toxicity test (e.g., bacteria or amphipod). |
| ALTGROUP | Text | 20 | Group of organism used in toxicity test - alternate. |
| SPECIES | Text | 40 | Species used in toxicity test. |
| SPPCODE | Text | 3 | Code used to indicate species used in toxicity test. |
| LHS | Text | 10 | Life stage of organism used in toxicity test. |
| LHSCODE | Text | 1 | Code used to indicate life stage of organism used in toxicity test. |
| ENDPOINT | Text | 30 | Endpoint of toxicity test (e.g., growth or survival). |
| ENDCODE | Text | 2 | Code used to indicate endpoint of toxicity test. |
| DURATION | Text | 10 | Duration of toxicity test. |
| DURCODE | Text | 4 | Code used to indicate duration of toxicity test. |
| HABITAT | Text | 2 | Query Manager field (not populated). |
| EDITDATE | Date/Time | 8 | Query Manager field (not populated). |
| EDITDATE2 | Text | 8 | Query Manager field (not populated). |
| EDITBY | Text | 15 | Query Manager field (not populated). |
| **lkp - TISSQUAL** | **NA** | **NA** | **Lookup table for tissue chemistry qualifiers (QUALCODE).** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **lkp - TISSQUAL (cont.)** | | | |
| QUALCODE | Text | 5 | Qualifier code for concentration value, modified to be compatible with Query Manager (all ND data has a "U" in this field). |
| QUALIFIERS | Text | 30 | Qualifier code for concentration value, as designated in report. |
| DESCRIPT | Text | 80 | Description of the meaning of the qualifier, as indicated in the original report or data file. |
| MESL_LIBNO | Text | 50 | MESL - library number. |
| **lkp - TISSTYPE** | **NA** | **NA** | **Lookup table for tissue sample tissue types (TISSCODE).** |
| TISSCODE | Text | 6 | Tissue type code. |
| DESCRIPT | Text | 50 | Description of tissue type. |
| EDITDATE | Date/Time | 8 | Query Manager field (not populated). |
| EDITDATE2 | Text | 8 | Query Manager field (not populated). |
| EDITBY | Text | 15 | Query Manager field (not populated). |
| **ptbl - AVS_SEM** | **NA** | **NA** | **Sediment chemistry results for Acid Volatile Sulfides and Simultaneously Extracted Metals (units of µmol/g).** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| STATIONID | Text | 6 | Station ID code (this is the MESL_STATIONID, unless it exceeded 6 characters, then the QM_STATIONID was substituted). |
| SAMPLEID | Text | 2 | Sample ID code. |
| FIELDREP | Text | 2 | Identifies field replicate samples (samples collected in close proximity). |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl - AVS_SEM (cont.)** | | | |
| LABREP | Text | 2 | This field will not be populated (lab dups will be averaged and the MESL_LABREP_AVG field identifies these averaged results). |
| CHEMCODE | Text | 10 | Chemical code (defined in lkp - CHEMDICT). |
| QUALCODE | Text | 5 | Qualifier code for concentration value, modified to be compatible with Query Manager (all ND data has a "U" in this field). |
| CONC | Number | 8 | Chemical concentration (dry weight basis). |
| UNITS | Text | 6 | Units of chemical concentration. |
| MEASBASIS | Text | 2 | Measurement basis - dry weight (DW). |
| MISSINGVAL | Yes/No | 1 | Yes' indicates a missing value (i.e., not reported, not sampled, lost, etc; -9 entered in CONC field). |
| MESL_LIBNO | Text | 20 | MESL - library number. |
| MESL_STATIONID | Text | 50 | MESL - station ID (retains the Station ID code as it appears in the original datafiles and/or reports). |
| MESL_UNITS | Text | 7 | MESL - units of concentration value. |
| MESL_QUAL_CALC | Text | 10 | MESL - qualifier code for concentration value - used for calculation purposes (NUM - value, U - less than detect value; X - do not include in calculations). |
| MESL_semqual | Text | 50 | MESL - qualifier code to indicate whether to use SEM metal conc. or total metal conc. (B entered in this field indicates that both are measured, therefore do not use the SEM result). |
| MESL_C_TXT | Text | 50 | MESL - concentration value represented in a text field (nondetected results include a "<"). |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl - AVS_SEM (cont.)** | | | |
| MESL_LABDUP_AVG | Yes/No | 1 | MESL - indicates if Lab Reps were averaged. |
| MESL_C_CALC | Number | 8 | MESL - concentration value represented in a number field (nondetected results included as 1/2 the detection limit). |
| MESL_EXCLUDE HIGH ND | Text | 50 | MESL - X entered in this field indicates a nondetected result with a detection limit greater than the Level II SQT. |
| MESL_comment | Text | 250 | MESL - comments. |
| **ptbl - BIOSUMM** | **NA** | **NA** | **Sediment toxicity test and bioaccumulation test results.** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| STATIONID | Text | 6 | Station ID code (this is the MESL_STATIONID, unless it exceeded 6 characters, then the QM_STATIONID was substituted). |
| SAMPLEID | Text | 2 | Sample ID code. |
| FIELDREP | Text | 2 | Identifies field replicate samples (samples collected in close proximity). |
| TESTID | Text | 12 | Code describing the bioassay (see lkp - TESTDICT table for a description of the codes). |
| GROUP | Text | 2 | Query Manager field (did not populate). |
| SERIES | Text | 2 | Associates control sample results with test results. |
| EFFECTVAL | Number | 8 | Toxicity test result (e.g., percent survival). |
| SIGEFFECT | Yes/No | 1 | Toxic (-1) or Not toxic (0). |
| NEG | Yes/No | 1 | Negative control sample? Yes (-1) or No (0). |
| REF | Yes/No | 1 | Reference sample? Yes (-1) or No (0). |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl – BIOSUMM (cont.)** | | | |
| STAT | Yes/No | 1 | Identifies sample used to determine significance (T/NT) - ND results (i.e., growth endpoint not measured because of low survival) from SQT database added as NOT TOXIC. |
| SIG_ORIGIN | Text | 50 | Original significance designations - from QM database. |
| CTRLADJ | Number | 8 | Control adjusted result (test result/control result*100). |
| TOXCODE | Text | 1 | Query Manager field (did not populate). |
| MESL_LIBNO | Text | 50 | MESL - library number. |
| MESL_STATIONID | Text | 50 | MESL - Station ID (retains the Station ID code as it appears in the original datafiles and/or reports). |
| MESL_TOXIC | Text | 2 | Toxic (T), Not toxic (NT), or ND (growth endpoint not measured because of low survival). |
| MESL_comment | Text | 250 | MESL - comments. |
| **ptbl - CHEM** | **NA** | **NA** | **Sediment chemistry results for surficial sediment samples (upper depth 0 cm and lower depth </= 30 cm).** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| STATIONID | Text | 6 | Station ID code (this is the MESL_STATIONID, unless it exceeded 6 characters, then the QM_STATIONID was substituted). |
| SAMPLEID | Text | 2 | Sample ID code. |
| FIELDREP | Text | 2 | Identifies field replicate samples (samples collected in close proximity). |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl - CHEM (cont.)** | | | |
| LABREP | Text | 2 | This field will not be populated (lab dups will be averaged and the MESL_LABREP_AVG field identifies these averaged results). |
| CHEMCODE | Text | 10 | Chemical code (defined in lkp - CHEMDICT). |
| QUALCODE | Text | 5 | Qualifier code for concentration value, modified to be compatible with Query Manager (all ND data has a "U" in this field). |
| CONC | Number | 8 | Chemical concentration (dry weight basis) |
| UNITS | Text | 6 | Units of chemical concentration. |
| MEASBASIS | Text | 2 | Measurement basis - dry weight (DW). |
| MISSINGVAL | Yes/No | 1 | 'Yes' indicates a missing value (i.e., not reported, not sampled, lost, etc; -9 entered in CONC field). |
| MESL_LIBNO | Text | 20 | MESL - library number. |
| MESL_STATIONID | Text | 50 | MESL - station ID (retains the Station ID code as it appears in the original datafiles and/or reports). |
| MESL_UNITS | Text | 7 | MESL - units of concentration value. |
| MESL_QUAL_CALC | Text | 10 | MESL - qualifier code for concentration value - used for calculation purposes (NUM - value, U - less than detect value; X - do not include in calculations). |
| MESL_semqual | Text | 50 | MESL - qualifier code to indicate whether to use SEM metal conc. or total metal conc. (B entered in this field indicates that both are measured, therefore do not use the SEM result). |
| MESL_C_TXT | Text | 50 | MESL - concentration value represented in a text field (nondetected results include a "<"). |
| MESL_LABDUP_AVG | Yes/No | 1 | MESL - indicates if Lab Reps were averaged. |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl - CHEM (cont.)** | | | |
| MESL_C_CALC | Number | 8 | MESL - concentration value represented in a number field (nondetected results included as 1/2 the detection limit). |
| MESL_EXCLUDE HIGH ND | Text | 50 | MESL - X entered in this field indicates a nondetected result with a detection limit greater than the Level II SQT. |
| MESL_comment | Text | 250 | MESL - comments. |
| **ptbl - CHEMTISS** | **NA** | **NA** | **Tissue chemistry results.** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| STATIONID | Text | 10 | Station ID code (this is the MESL_STATIONID, unless it exceeded 6 characters, then the QM_STATIONID was substituted). |
| SAMPLEID | Text | 2 | Sample ID code. |
| FIELDREP | Text | 2 | Identifies field replicate samples (samples collected in close proximity). |
| LABREP | Text | 2 | Not populated (lab dups will be averaged and the MESL_LABREP_AVG field identifies these averaged results). |
| CHEMCODE | Text | 10 | Chemical code (defined in lkp - chemdict) |
| CONC | Number | 8 | Chemical concentration (wet weight basis). |
| QUALCODE | Text | 5 | Qualifier code for concentration value, as designated in report (see lkp_TISSQUAL table for a description of the codes). |
| UNITS | Text | 6 | Units of chemical concentration. |
| MEASBASIS | Text | 2 | Measurement basis - wet weight (WW). |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl - CHEMTISS (cont.)** | | | |
| MISSINGVAL | Yes/No | 1 | 'Yes' indicates a missing value (i.e., not reported, not sampled, lost, etc; -9 entered in CONC field). |
| MESL_LIBNO | Text | 20 | MESL - library number. |
| MESL_STATIONID | Text | 50 | MESL - Station ID (retains the Station ID code as it appears in the original datafiles and/or reports). |
| MESL_UNITS | Text | 7 | MESL - units of concentration value. |
| MESL_QUAL_CALC | Text | 10 | MESL - qualifier code for concentration value - used for calculation purposes (NUM - value, U - less than detect value; X - do not include in calculations; UX - less than MDL, detection limit not known). |
| MESL_comment | Text | 250 | MESL - comments. |
| MESL_CONC_TXT | Text | 50 | MESL - concentration field that retains significant figures reported in datafile/study, as well and "<" symbols (for printing). |
| MESL_LABREP_AVG | Yes/No | 1 | MESL - "Yes" indicates an averaged result for laboratory duplicates (QA/QC split samples which were both analyzed by the lab). |
| **ptbl - Mean PEC-Q** | **NA** | **NA** | **Mean Probable Effect Concentration-Quotients (Mean PEC-Q). NOT A QUERY MANAGER TABLE.** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| STATIONID | Text | 6 | Station ID code (this is the MESL_STATIONID, unless it exceeded 6 characters, then the QM_STATIONID was substituted). |
| SAMPLEID | Text | 2 | Sample ID code. |
| FIELDREP | Text | 2 | Identifies field replicate samples (samples collected in close proximity). |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl - Mean PEC-Q (cont.)** | | | |
| LABREP | Text | 2 | This field will not be populated (lab dups will be averaged and the MESL_LABREP_AVG field identifies these averaged results). |
| PECQ met | Number | 8 | PEC quotient for metals. |
| PECQ pah | Number | 8 | PEC quotient for PAHs. |
| PECQ pcb | Number | 8 | PEC quotient for PCBs. |
| MeanPECQ | Number | 8 | Mean PEC quotient (as calculated). |
| MeanPECQ (3 sf) | Number | 8 | Mean PEC quotient (3 significant figures). |
| **ptbl - SAMPLE** | **NA** | **NA** | **Surficial sediment sample information (upper depth 0 cm and lower depth </= 30 cm).** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| STATIONID | Text | 6 | Station ID code (this is the MESL_STATIONID, unless it exceeded 6 characters, then the QM_STATIONID was substituted). |
| SAMPLEID | Text | 2 | Sample ID code. |
| FIELDREP | Text | 2 | Identifies field replicate samples (samples collected in close proximity). |
| LABREP | Text | 2 | This field will not be populated (lab dups will be averaged and the MESL_LABREP_AVG field identifies these averaged results). |
| UDEPTH | Number | 8 | Upper sampling depth (cm). |
| LDEPTH | Double | 8 | Lower sampling depth (cm). |
| SAMPDATE | Text | 8 | Sample date (YYYYMMDD). |
| SAMPTIME | Text | 5 | Sample time. |
| TOC | Number | 8 | Total organic carbon (%). |
| PCTFINES | Number | 8 | Percent fines (sand + clay). |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl - SAMPLE (cont.)** | | | |
| UAN_PW | Number | 8 | Unionized ammonia in pore water. |
| H2S_PW | Number | 8 | Hydrogen sulfide in pore water. |
| EXSAMPID | Text | 15 | Original station ID reported in study or data file. |
| MESL_LIBNO | Text | 50 | MESL - library number. |
| MESL_STATIONID | Text | 50 | MESL - station ID (retains the Station ID code as it appears in the original datafiles and/or reports). |
| MESL_Mean PEC-Q | Number | 8 | MESL - Mean PEC-Q (3 significant figures). |
| MESL_MATCH | Text | 50 | MESL - indicates if the sample has matching sediment chemistry and toxicity data. |
| MESL_WATERDEPTH | Text | 50 | MESL - water depth at the point of sediment sampling (m). |
| MESL_SOFTDEPTH | Text | 50 | MESL - soft sediment depth (m). |
| MESL_SEDDESC | Text | 255 | MESL - sediment description (have included the sediment description if this data was available electronically). |
| MESL_SURF_SUB | Text | 50 | MESL - indicates if the sample is designated as surficial or sub-surface, according to NOAA's Query Manager rules. |
| MESL_comments | Text | 255 | MESL - comments. |
| **ptbl - SITE** | **NA** | **NA** | **QM table.** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| SITENAME | Text | 40 | |
| EPAREGION | Number | 2 | |
| COUNTY | Text | 25 | |
| STATE | Text | 2 | |
| CERCLIS | Text | 12 | |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl – SITE (cont.)** | | | |
| REACH | Text | 8 | |
| REACHSEG | Text | 11 | |
| LATITUDE | Number | 8 | |
| LONGITUDE | Number | 8 | |
| WATERSHED | Text | 20 | |
| **ptbl - SMPTISS** | **NA** | **NA** | **Tissue sample information.** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| STATIONID | Text | 10 | Station ID code (this is the MESL_STATIONID, unless it exceeded 6 characters, then the QM_STATIONID was substituted). |
| SAMPLEID | Text | 2 | Sample ID code. |
| FIELDREP | Text | 2 | Identifies field replicate samples (samples collected in close proximity). |
| LABREP | Text | 2 | Not populated (lab dups will be averaged and the MESL_LABREP_AVG field identifies these averaged results). |
| SAMPDATE | Text | 8 | Date sample collected (YYYYMMDD). |
| SAMPTIME | Text | 5 | Time sample collected. |
| SPECIES | Text | 5 | Species from which the tissue sample was collected (see the lkp_SPECIES table for a description of the codes). |
| SPP | Text | 5 | Species code (see the lkp_SPECIES table for a description of the codes). |
| TISSUE | Text | 30 | Tissue type analyzed (see the lkp_TISSTYPE table for a description of the codes). |
| TISSCODE | Text | 6 | Tissue type code (see the lkp_TISSTYPE table for a description of the codes). |
| LIFESTAGE | Text | 1 | Lifestage of the organism at the time of sampling (not populated). |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl - SMPTISS (cont.)** | | | |
| NOINCOMP | Number | 2 | Number of individuals in a composite sample. |
| LENGTH | Number | 8 | Length (cm) of individual organisms collected for tissue analysis. |
| WEIGHT | Number | 8 | Weight of individual organisms collected for tissue analysis (not populated). |
| SEX | Text | 1 | Sex of individual organisms collected for tissue analysis (not populated). |
| AGE | Number | 2 | Age of individual organisms collected for tissue analysis (not populated). |
| PCTLIPID | Number | 8 | Percent lipids (%). |
| EXSAMPID | Text | 15 | Query Manager field (not populated). |
| MESL_LIBNO | Text | 50 | MESL - library number. |
| MESL_STATIONID | Text | 50 | MESL - Station ID (retains the Station ID code as it appears in the original datafiles and/or reports). |
| MESL_COMMENT | Text | 255 | MESL - comments. |
| **ptbl - STATION** | **NA** | **NA** | **Station information (sediment and tissue samples).** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| STATIONID | Text | 6 | Station ID code (this is the MESL_STATIONID, unless it exceeded 6 characters, then the QM_STATIONID was substituted). |
| AREA | Text | 50 | Waterbody (corresponds with 'DB_AREA' theme in GIS projects). |
| LOCDESC | Text | 50 | Reach (corresponds with 'Location Description' theme in GIS projects). |
| EST_STN | Text | 50 | Code indicating how the geographic coordinates were obtained (R = reported; P = plotted in GIS based on a map from the report; E = estimated using site descriptions from report; U = unknown). |
| LATITUDE | Number | 8 | Geographical coordinates (decimal degrees). |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl - STATION (cont.)** | | | |
| LONGITUDE | Number | 8 | Geographical coordinates (decimal degrees). |
| X-coord | Text | 50 | Geographical coordinates (UTM Zone 15 NAD83 datum). |
| Y-coord | Text | 50 | Geographical coordinates (UTM Zone 15 NAD83 datum). |
| MESL_LIBNO | Text | 50 | MESL - library number. |
| MESL_EST_STN | Text | 50 | Description of how the geographic coordinates were obtained. |
| MESL_CORELENGTH | Text | 50 | MESL - core length (units are in meters). Note that this field has only been populated when the information has been readily available (electronic format). |
| MESL_Habitat class | Text | 50 | MESL - relevant to REMAP studies only (STUDYID 04 & 06). Codes: 1 = Shallow area; 2 = Channel; 3 = Reservoir. |
| MESL_LOCDESC2 | Text | 50 | MESL - additional station location descriptions. |
| MESL_COMMENTS | Text | 150 | MESL - comments. |
| **ptbl - STUDY** | **NA** | **NA** | **Studynames and the types of data associated with each study.** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| STUDYNAME | Text | 40 | Study name. |
| CONTACT | Text | 40 | Contact person/agency. |
| SEDCHEM | Yes/No | 1 | Indicates if the study has surficial sediment chemistry data incorporated in the database. |
| SEDTOX | Yes/No | 1 | Indicates if the study has sediment toxicity data incorporated in the database. |
| SUBSURF | Yes/No | 1 | Indicates if the study has sub-surface sediment chemistry data incorporated in the database. |
| LABACCUM | Yes/No | 1 | Indicates if the study has bioaccumulation test data incorporated in the database. |
| TISSCHEM | Yes/No | 1 | Indicates if the study has tissue chemistry data incorporated in the database. |

Table A-2. Continued

| TABLE NAME / Field Name | Data Type | Field Size | TABLE DESCRIPTION / Field Description |
|---|---|---|---|
| **ptbl – STUDY (cont.)** | | | |
| Location/Sampling Year | Text | 40 | Location and sampling year. |
| MESL_LIBNO | Text | 50 | MESL library number. |
| **ptbl - STUDYNOT** | **NA** | **NA** | **Study notes.** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| NOTES | Memo | - | Notes. |
| MESL_LIBNO | Text | 50 | MESL - library number. |
| **ptbl - STUDYREF** | **NA** | **NA** | **Bibliographic references for each study.** |
| SITEID | Text | 4 | Site ID code (from Query Manager). |
| STUDYID | Text | 2 | Study ID code. |
| YEAR | Text | 4 | Publish year for report. |
| AUTHORS | Text | 160 | Authors of the report. |
| TITLE | Text | 160 | Title of the report. |
| SOURCE | Text | 160 | Source (locations). |
| STUDYCOMM | Text | 160 | Comments. |
| MESL_LIBNO | Text | 50 | MESL - library number. |

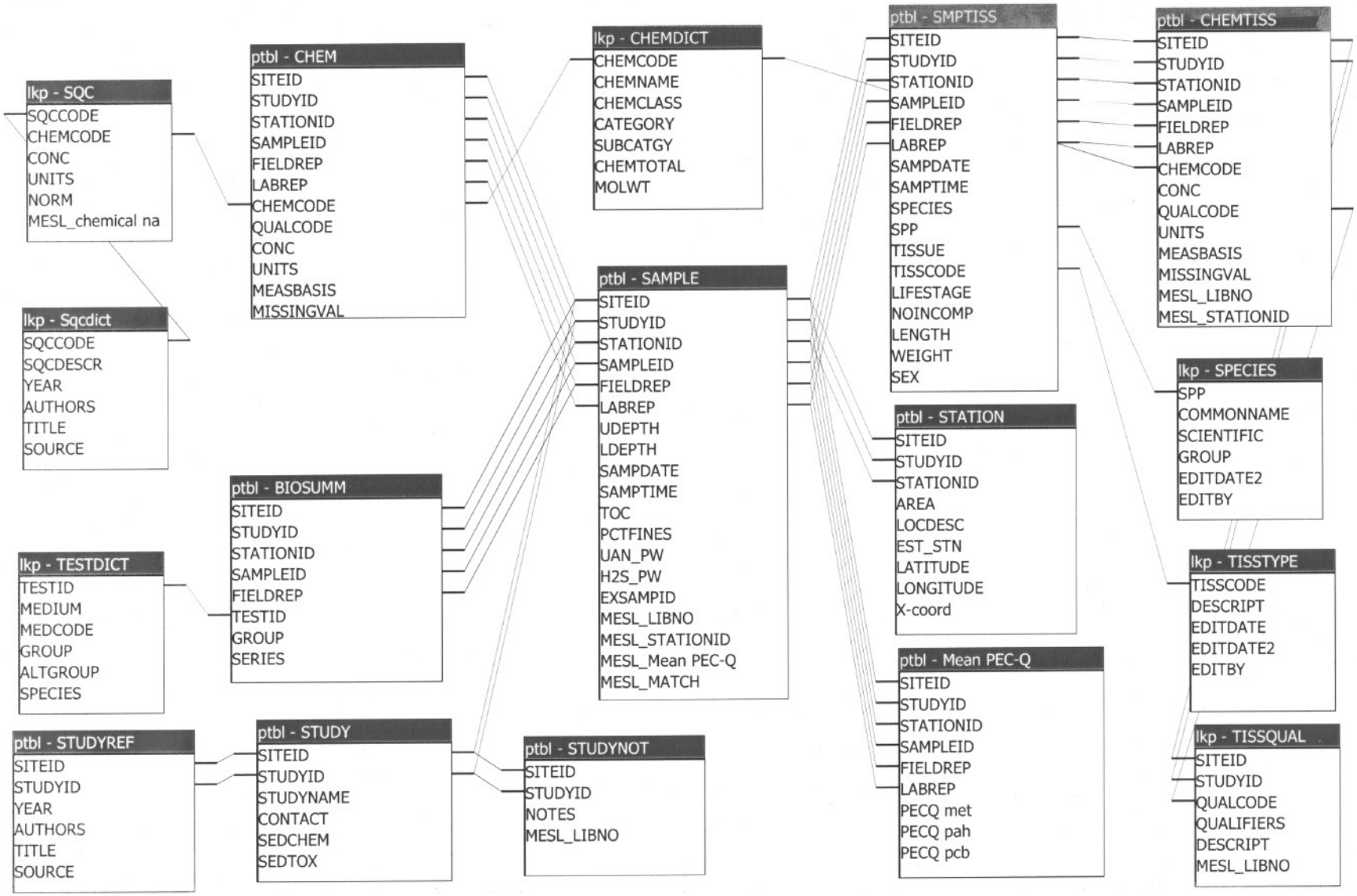


Figure A-5. Diagram showing the relationships between database components.

The following section will describe the work tasks to be conducted and the associated QA/QC goals, procedures, and timetables for completing tasks.

## A3.2 Description of the Work to be Performed

The MPCA and MESL will expand the Phase I GIS-based sediment quality database to include additional sediment quality and GIS-watershed data sets for the St. Louis River AOC. Work tasks will follow this QAPP, as well as the Technical Documentation (Smorong *et al*., 2003b) prepared for the Phase I project. The Technical Documentation included:

- A description of the general structure and contents of the Phase I MS™ Access 2000 sediment quality database;
- A description of the tables that were used to store the various types of data;
- A description of the quality assurance steps that were undertaken to assure the quality of the underlying data;
- A discussion regarding data treatment options and other data management issues;
- A description of the ArcView 3.2 projects and the associated GIS data; and,
- A discussion of administrative details relating to the distribution of the project CDs and access to future updates of the MS™ Access 2000 database and ArcView 3.2 projects.

Specific work tasks for the Phase II project (and responsible organizations for completing tasks) include the following:

- Prepare a professional/technical contract certification form and a single-source professional/technical contract for MESL, in the amount of $45,000, for work on this project. (MPCA)

- Develop a detailed work plan and QAPP. (MPCA)

- Determine the availability of additional GIS-based watershed data, such as the shapefiles for the Superior Port Land Use maps from the ARDC and habitat shapefiles for Douglas county from the WDNR. (MESL; MPCA)

- Populate the MS™ Access 2000 database with additional chemical, physical (e.g., particle size), and bioeffects data (i.e., sediment toxicity, bioaccumulation, benthic community, and fisheries data; Table A-3), as well as with the SQGs used by the WDNR (WDNR, 2003). Save this database in MS™ Access ’97 format for stakeholders lacking MS™ Access 2000. (MESL)

Table A-3. Sediment Quality Data Sets Pending Inclusion in the MS™ Access 2000 database

| Reference | Location | Sediment Chemistry | Toxicity Test Data | Benthic Data | Bioaccu-mulation Data | Sampling Year(s) |
|---|---|---|---|---|---|---|
| Ankley *et al*. (1994)* | Duluth-Superior Harbor | PAHs, TOC | Yes | No | No | 1994 |
| Blasland Bouck and Lee, Inc. (2000) | Koppers Industries, Inc. | Need to obtain report to determine list of chemicals analyzed | ? | ? | ? | ? |
| Costa (2001) | Reservation lakes near St. Louis River | PCBs, Pb, Hg, TVS, solids, particle size | Yes | No | No | 2000 |
| Costa (2004) | Reservation lakes near St. Louis River; | methyl Hg; | No; | No; | Yes (fish tissue); | 2000; |
| | 12 additional St. Louis River samples | PCBs, Pb, Hg, methyl Hg, TVS, solids, particle size | Yes | No | No | 2002 |
| Crane (1997); MPCA (unpublished data)* | USX and Interlake/Duluth Tar Superfund Sites | Metals, Hg, PAHs, ammonia, cyanide, oil & grease, TOC, phenol | Yes | No | No | 1993 |
| Crane *et al*. (1997) | Duluth-Superior Harbor | Yes – in Phase I database | Yes – in Phase I database | Yes | No | 1994 |
| DeFoe and Ankley (1998) | Hog Island Inlet and Stryker Bay | No | Yes | No | No | 1993, 1994 |

Table A-3. Continued

| Reference | Location | Sediment Chemistry | Toxicity Test Data | Benthic Data | Bioaccu-mulation Data | Sampling Year(s) |
|---|---|---|---|---|---|---|
| IT Corporation (1997)* | Interlake/Duluth Tar Superfund Site | SEM metals, AVS, PAHs, TOC, metals, Hg, ammonia, cyanide, BTEX, particle size | Yes | Yes | No | 1996 |
| MPCA (1997a,b); Breneman *et al*. (2000); USEPA (In prep.) | St. Louis River AOC | Yes – in Phase I database | Yes – in Phase I database | Yes | No | 1995, 1996 |
| MPCA (unpublished data) based on QAPP (Bay West, Inc. 2001) | Interlake/Duluth Tar Superfund Site | PAHs, metals, dioxins and furans, octachlorostyrene, hexachlorobenzene, PCBs, cyanide, sulfate, TOC, and particle size | Yes | Yes | Yes | 2001 |
| Oliaei *et al.* (2002) | Vicinity of WLSSD | Yes – in Phase I database | No | No | Yes (fish tissue) | 2001 |
| Redman and Janisch (1995) | Newton Creek/Hog Island Inlet | Metals, Hg, DROs, PAHs, oil & grease, ammonia, cyanide, TOC, particle size | Yes | Yes | No | 1993, 1994 |
| Richards and Breneman (1994) | USS and Interlake/Duluth Tar Superfund Sites | No | No | Yes | No | 1993 |
| SEH Inc. (1994) | Fraser Shipyards | Need to obtain report to determine list of chemicals analyzed | ? | ? | ? | ? |

Table A-3. Continued

| Reference | Location | Sediment Chemistry | Toxicity Test Data | Benthic Data | Bioaccu-mulation Data | Sampling Year(s) |
|---|---|---|---|---|---|---|
| SEH Inc. (2000) | Newton Creek Segments B and C | PAHs, DROs, TOC, oil and grease, PCBs, VOCs, metals, cyanide, ammonia | Yes | Yes | No | 1999, 2000 |
| SEH Inc. (2003a) | Newton Creek Segments B and C | PAHs, VOCs, metals, Hg, AVS, SEM, TOC, particle Size | No | No | No | 2002 |
| SEH Inc. (2003b) | Hog Island Inlet | PAHs, VOCs, TOC, DROs, metals, AVS metals, SEM, particle size | Yes | Yes | No | 2002 |
| Smith *et al*. (1992)* | Allouez Bay, WLSSD, others | Metals, total PCBs, total PAHs, particle size | Yes | No | Yes (fish tissue) | 1992 |
| Sorensen *et al*. (1996) and Glass *et al*. (1998) | Knife Falls, Potlatch, Scanlon, Thomson, Forbay, and Fond du Lac Reservoirs | Hg | No | Yes | Yes | 1995, 1996 |
| Thijssen (1997) | 10 R-EMAP sites (but not associated with the R-EMAP project) | PAHs, TOC | No | No | Yes | 1996 |
| TMA (1996) | Duluth-Superior Harbor | Metals, Hg, ammonia, phosphorus, cyanide, COD, TOC, oil & grease, PCBs, PAHs, pesticides, particle size | Yes | No | Yes | 1995, 1996 |

Table A-3. Continued

| Reference | Location | Sediment Chemistry | Toxicity Test Data | Benthic Data | Bioaccu-mulation Data | Sampling Year(s) |
|---|---|---|---|---|---|---|
| URS Corporation (2003) | USS Superfund Site | Metals; Hg; SEM metals, AVS, PAHs, PCBs, dioxins/furans, VOCs, TOC, DROs, carbazole, dibenzofuran, hexachlorobenzene, octachlorostyrene, particle size, ammonia | No | No | No | 2002 |
| USACE DACW35-91-D-0001/0040 | Nemadji Shoals and Lakehead Sites | Metals, PAHs, PCBs, pesticides, BNAs, VOCs, ammonia, cyanide, TOC, particle size | In review | No | No | 1992 |
| USACE DACW35-93-D-0005 Delivery order 16 | Duluth-Superior Cross Channel | Metals, PAHs, PCBs, pesticides, ammonia, cyanide, TOC, particle size | In review | No | No | 1993 |
| USACE DACW35-93-D-0005 Delivery order 29 | Duluth-Superior Harbor | Metals, PAHs, PCBs, pesticides, ammonia, cyanide, TOC, particle size | In review | No | No | 1994 |
| USACE DACW35-93-D-0005 Delivery order 36 | Duluth-Superior Harbor (Deep Hole) | Metals, PAHs, PCBs, ammonia, particle size | No | No | No | 1994 |

Table A-3. Continued

| Reference | Location | Sediment Chemistry | Toxicity Test Data | Benthic Data | Bioaccu-mulation Data | Sampling Year(s) |
|---|---|---|---|---|---|---|
| USACE DACW35-95-D-0002 Delivery order 28 | Duluth Entrance Channel | Metals, PAHs, PCBs, pesticides, ammonia, cyanide, TOC, particle size | No | No | No | 1995 |
| WDNR (2003b) | Fraser Shipyards | Pb, PAHs (check for other chemicals when obtain report) | No | No | No | 2002 |
| Wenck Associates (1995)* | Lakehead Pipe Line (North of Hog Island Inlet) | metals, Hg, DROs, PAHs, oil & grease, ammonia, TOC, particle size | Yes | No | No | 1995 |
| West and Ankley (1998) | Hog Island Inlet and Superior Bay | No | Yes | No | No | ? |
| West Central Environmental Consultants (2004) | Minnesota Slip | PAHs, PCBs, DROs, metals, Hg, TOC, particle size | No | No | No | 2004 |

* Only matching sediment chemistry and toxicity data from this study were included in the Phase I GIS-based sediment quality database.

- Translate the MS™ Access 2000 database to a format compatible with Query Manager 2.5 (which will contain mean PEC-Qs). Coordinate with NOAA staff and their contractor to have them incorporate the Phase II MS™ Access 2000 database into NOAA's Watershed database for the St. Louis River AOC (which uses Query Manager 2.5 and does not include mean PEC-Qs). (MESL)

- Update the ArcView 3.2 projects with new GIS shapefiles, and translate these projects to ArcView 8.3. (MESL)

- Prepare updated Help Sections for database and ArcView users. (MESL; MPCA)

- Prepare updated technical documentation of the MS™ Access '97/2000 and Query Manager 2.5 databases and accompanying ArcView projects. (MESL; MPCA)

- Provide comparisons of the mean PEC-Qs for matching sediment chemistry and toxicity data from the St. Louis River AOC with other sites in the Great Lakes area and in North America. This task will involve the use of MESL's proprietary sediment toxicity database of matching sediment chemistry and toxicity data for freshwater sites in North America. (MESL)

- Distribute a CD version of the work products to MPCA staff and interested partners/stakeholders. (MPCA)

- Update the MPCA's Contaminated Sediment Web page to include PDF copies of the Phase II Help Sections for database users and ArcView users, as well as an announcement about the availability of the Phase II GIS-based sediment quality database. (MPCA)

A schedule of the major milestones for this project are given in Table A-4.

Table A-4. Schedule of Project Milestones

| **Project Milestones** | **Dates** |
|---|---|
| • Complete Contract with MESL | 9/2003 |
| • Complete and Approve QAPP | 5/2004 |

Table A-4. Continued

| Project Milestones | Dates |
|---|---|
| • Complete Phase II MS™ Access 2000 Database | 10/2004 |
| • Translate Phase II MS™ Access 2000 Database to MS™ Access '97 and format compatible with Query Manager 2.5 | 10/2004 |
| • Complete Phase II ArcView 3.2 Projects | 10/2004 |
| • Translate Phase II ArcView 3.2 Projects to ArcView 8.3 Projects | 10/2004 |
| • Complete Updated Help Sections for Database Users and ArcView Users and Updated Technical Documentation | 11/2004 |
| • Complete Updated Mean PEC-Q Comparison | 12/2004 |
| • Project End | 12/2004 |

## A4 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

### A4.1 Purpose/Background

The purpose of this section is to document the Data Quality Objectives (DQOs) of the project. In addition, performance criteria will be established for the planning process and measurement system that will be employed in evaluating sediment quality and fisheries data collected from other sources for use in the GIS-based sediment quality database.

### A4.2 Specifying Quality Objectives

The DQO Process is a series of planning steps based on the Scientific Method that is designed to ensure that the type, quality, and quantity of environmental data used in decision making are appropriate for the intended application. DQOs are qualitative and quantitative statements derived from outputs of each step of the DQO Process that:

- Clarify the intended use of the data;
- Define the type of data needed to support the decision;

- Identify the conditions under which the data should be collected; and,
- Specify tolerable limits on the probability of making a decision error due to uncertainty in the data.

The DQO process consists of the following seven steps:

1. State the problem;
2. Identify the decision;
3. Identify inputs to the decision;
4. Define the study boundaries;
5. Develop a decision rule;
6. Specify limits on decision errors; and
7. Optimize the design for obtaining data.

Data Quality Indicators (DQIs) can be developed for a sampling activity through the use of the DQO process (USEPA, 1998).

For this project, the individual steps of the DQO process are listed below.

1. State the Problem

- The members of the project team were previously described in Section A1.2.
- The primary decision maker for this project is the MPCA Project Manager, who will solicit input from the contractor, MPCA Grant Manager, and expected data users.
- The description of contamination problems in the St. Louis River AOC was identified in Section A2.2.
- The financial resources available to carry out this project include GLNPO grant number GL97540401-2 for $45,000 plus a state match of $2,368. In addition, staff support from the MPCA will be available for clerical and word processing assistance. The timeline for meeting major project deliverables is provided in Table A-4. This component of the grant will be completed by December 30, 2004.

2. Identify the Decision

- The principal study question is: what is the best approach for managing sediment quality and fisheries data collected from the St. Louis River AOC, in addition to GIS-based watershed data, so that the Phase II GIS-based sediment quality database will be of most use to the MPCA and stakeholders?
- Alternative actions that could result from resolution of the principal study question include:
    - Tracking of critical pollutants included in the Lake Superior LaMP;
    - Facilitate efforts to reduce use impairments listed in the St. Louis River RAP;

  - Provide a tool for the MPCA, Minnesota Department of Natural Resources (MDNR), WDNR, Fond du Lac Band, and U.S. Army Corps of Engineers to use to quantify the actual environmental results of their work (e.g., status and trends work, effectiveness of sediment remediation);
  - Identify areas for possible sediment remediation based on the weight-of-evidence of sediment quality data;
  - Provide sediment quality data for ecological and human health risk assessments in the St. Louis River AOC; and,
  - Provide a model for other Great Lakes AOCs to utilize for managing sediment quality and fisheries data with useful GIS watershed data.
- A decision statement for the St. Louis River AOC would be to ensure all remaining sources of sediment quality data collected since 1990, and environmentally-related GIS data for the AOC, be evaluated for inclusion in the Phase II GIS-based sediment quality database.
- Stakeholder input, obtained during the Phase I project (MacDonald *et al*., 2001), will be used to guide decisions about the inclusion of sediment quality and fisheries data, as well as GIS watershed data, into the Phase II GIS-based database.

3. Identify Inputs to the Decision

- To resolve the decision statement, expansion of the Phase I GIS-based sediment quality database will be conducted. In addition, an updated evaluation of electronic sources of sediment quality and fisheries data currently available (and expected to be available by September 30, 2004) will be conducted. Finally, the availability of additional GIS-based watershed data will be assessed. Specific input to the decision statement is further described in Section A3.2.

4. Define the Boundaries of the Study

- The characteristics that define the population of interest are the following components:
  - Sediment chemistry data [e.g., mercury, PAHs, PCBs, dioxins/furans, pesticides (e.g., DDT metabolites, toxaphene), brominated flame retardants, metals, total organic carbon];
  - Physical parameter data (e.g., particle size);
  - Sediment toxicity test results for acute and chronic toxicity tests;
  - Tissue residue data for fish and invertebrates;
  - Other fisheries data (e.g., incidence of tumors, fin rot);
  - Benthic invertebrate community data (i.e., for bottom feeding organisms);
  - Level I and Level II SQT values for Minnesota (Crane *et al*., 2000);
  - Level 1, Level 2, Level 3, and Level 4 SQG values for Wisconsin (WDNR, 2003);

    - GIS locational data for each sampling site (according to the format given at http://www.epa.gov/glnpo/ldp/App2.html); and,
    - QA/QC data for each chemical, physical, and biological parameter.
- The spatial boundary of the decision statement will be limited to:
    - The geographic area of the St. Louis River AOC from Cloquet, MN to the Duluth, MN and Superior, WI entries to Lake Superior.
    - The temporal boundary of the problem will be limited to a distinct period of time from 1990 to September 30, 2004. This time period was selected to correspond to MPCA sediment investigations funded by GLNPO and the U.S. EPA (in which QAPPs were prepared) and the availability of electronic data files. These data will be used to reflect the sediment quality conditions from which a decision can be made concerning future management actions in the St. Louis River.
    - The scale of decision making will be based on the inclusion of known sediment quality data sets and GIS watershed data into the GIS-based sediment quality database. Strategic alliances with other organizations (MDNR, WDNR, Fond du Lac Band) and cooperation from potentially responsible parties will be sought for them to provide georeferenced sediment quality data to the Project Manager in a format that can readily be brought into the MS™ Access 2000 database.
- Potential practical constraints on the project include the following items: inability to obtain electronic files of sediment quality and fisheries data, as well as GIS data, from designated sources, and a lack of funding to include all of these data into the Phase II GIS-based database.

5. Develop a Decision Rule

- Concentrations of contaminants will be compared to their corresponding Level I and Level II SQTs for use by the MPCA (Crane *et al*., 2000). Multiple contaminants will be considered through the calculation of mean PEC-Qs (Crane *et al*., 2000).
- All of the available chemical and bioeffects data will be evaluated using a weight-of-evidence approach before making management decisions about contaminated sites.
- If...then statements for the decision rule will follow the sediment assessment framework and contingency table of Crane *et al*. (2000).

6. Specify Tolerable Limits on Decision Errors

- The decision errors and null hypothesis will depend on how the data in the GIS-based database are utilized (see Section A2.2.4). One example scenario is given below.
  - For a sediment remediation scenario, the two decision errors are (i) deciding the weight-of-evidence data indicates the sediments are contaminated enough to warrant remediation when it truly does not, and (ii) deciding the weight-of-evidence data indicates the sediments are not contaminated enough to warrant remediation when it truly does.
    - The true state of nature for decision error (i) is that the area of interest does not need remediation.
    - The true state of nature for decision error (ii) is that the area of interest needs to be remediated.
  - The potential consequences of each decision error are:
    - The consequences of deciding that the area of interest warrants remediation, when it truly does not, will be that the MPCA will have lost time and resources that could have been used to remediate more worthy sites.
    - The consequences of deciding that the area of interest does not warrant remediation, when it truly does, will be that aquatic biota, and possibly humans, may be exposed to unacceptable risks at this site.
  - Decision error (ii) has more severe consequences since the risk of jeopardizing human health and ecological stability outweighs the consequence of lost resources and time spent evaluating the site.
  - The null hypothesis (baseline condition) and the alternative hypothesis are as follows:
    - The baseline condition, or null hypothesis ($H_o$), is that the weight-of-evidence of available data indicates the sediments require remediation.
    - The alternative hypothesis ($H_a$) is that the weight-of-evidence of available data indicates the sediments do not require remediation.
  - The false positive decision error occurs when the null hypothesis is rejected when it is true. The false negative decision error occurs when the null hypothesis is not rejected when it is false.
- The range of possible values of the parameter of interest, where the consequences of decision errors are relatively minor (gray region) must be specified on a case-by-case basis.

7. Optimize the Design

- The design of the Phase II GIS-based sediment quality database will be optimized by augmenting the design of the Phase I GIS-based sediment quality database with new data fields (e.g., benthic invertebrate community data) and ArcView projects, as needed.

## A4.3 Specifying Measurement Performance Criteria

An important feature of the QAPP is that it links the data user's quality objectives to verifiable measurement performance criteria. Since this study includes only pre-existing data, no measurement performance criteria will be established for the Phase II GIS-based database.

Data Quality Indicators (DQIs) are qualitative and quantitative descriptors used in interpreting the degree of acceptability or utility of data. The principal DQIs are precision, bias, representativeness, comparability, and completeness. Establishing acceptance criteria for the DQIs sets quantitative goals for the quality of data generated in the analytical measurement process. It will be beyond the scope of this project to list the project specific DQIs in the Phase II GIS-based sediment quality database. However, the DQIs may be considered in terms of averaging analytical duplicate or field replicate data. Analytical duplicate data will be averaged, if available, whereas field replicate data will be provided separately.

### A4.3.1 Precision

Precision is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions. This agreement is calculated as either the range (R) or as the standard deviation (s). It may also be expressed as a percentage of the mean of the measurements, such as relative percent difference (RPD) or relative standard deviation (RSD) (for three or more replicates).

Field precision is assessed through the collection and measurement of field replicates at a rate of one replicate per ten analytical samples. This allows intralaboratory precision information to be obtained on sample acquisition, handling, shipping, storage, preparation, and analysis. Both samples can be carried through the steps in the measurement process together to provide an estimate of short-term precision. An estimate of long-term precision can be obtained by separating the two samples and processing them at different times or by different people and/or analyzed using different instruments.

For duplicate measurements, RPD is calculated as follows:

$$RPD = \frac{|D_1 - D_2| \times 100\%}{(D_1 + D_2)/2}$$

RPD = relative percent difference
$D_1$ = sample value
$D_2$ = duplicate sample value

For three or more replicates:

$$RSD = (s/x) \times 100$$

RSD = relative standard deviation
s = standard deviation of three or more results
x = mean of three or more results

Standard deviation is defined as follows:

$$s = ((\sum(y_i - \text{mean } y)^2 \times 1/(n-1)))^{0.5}$$

s = standard deviation
$y_i$ = measured value of the ith replicate
mean y = mean of replicate measurements
n = number of replicates

### A4.3.2 Bias

Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction. Bias assessments for environmental measurements are made using personnel, equipment, and spiking materials or reference materials as independent as possible from those used in the calibration of the measurement system. When possible, bias assessments should be based on analysis of spiked samples rather than reference materials so that the effect of the matrix on recovery is incorporated into the assessment. A documented spiking protocol and consistency in following that protocol are important to obtaining meaningful data quality estimates. Spikes should be added at different concentration levels to cover the range of expected sample concentrations. For example, the use of spiked surrogate compounds for GC and GC/MS procedures for PCB congeners and PAH compounds, respectively, can be used to assess for bias.

### A4.3.3 Accuracy

Accuracy is a measure of the closeness of an individual measurement, or the average of a number of measurements, to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that result from sampling and analytical operations.

Accuracy in the field is assessed through the adherence to all sample handling, preservation, and holding times. In order to assure the accuracy of the analytical procedures, an environmental sample will be randomly selected from each sample shipment received at the laboratory, and

spiked with a known amount of the analytes to be evaluated. In general, a sample spike will be included in every set of 20 samples tested on each instrument. The spike sample will then be analyzed. The increase in concentration of the analyte observed in the spiked sample, due to the addition of a known quantity of the analyte, compared to the reported value of the same analyte in the unspiked sample determines the percent recovery. The percent recovery for a spiked sample is calculated according to the following formula:

$$\%R = 100\% \times (S-U)/C_{sa}$$

%R = percent recovery
S = measured concentration in spiked sample
U = measured concentration in unspiked sample
$C_{sa}$ = actual concentration of spike added

For situations where a standard reference material (SRM) is used in addition to a matrix spike:

$$\%R = 100\% \times C_m/C_{srm}$$

%R = percent recovery
$C_m$ = measured concentration of SRM
$C_{srm}$ = actual concentration of SRM

### A4.3.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative term that should be evaluated to determine whether *in situ* and other measurements are made and that physical samples are collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied.

For field data, representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the field sampling plan is followed and that proper sampling techniques are used. Representativeness in the laboratory is ensured by using the proper analytical and toxicity testing procedures; meeting sample holding times; and analyzing and assessing laboratory duplicates for the chemistry samples.

### A4.3.5 Comparability

Comparability is the qualitative term that expresses the confidence that two data sets can contribute to a common analysis and interpolation. Comparability must be carefully evaluated to establish whether two data sets can be considered equivalent in regard to the measurement of a specific variable or groups of variables. In a laboratory analysis, the term comparability focuses on method type comparison, holding times, stability issues, and aspects of overall analytical quantitation.

There are a number of issues that can make two data sets comparable, and the presence of each of the following items enhances their comparability:

- Two data sets should contain the same set of variables of interest;
- Units in which these variables were measured should be convertible to a common metric;
- Similar analytical procedures and quality assurance should be used to collect data for both data sets;
- Time measurements of certain characteristics (variables) should be similar for both data sets;
- Measuring devices used for both data sets should have approximately similar detection levels;
- Rules for excluding certain types of observations from both samples should be similar;
- Samples within data sets should be selected in a similar manner;
- Sampling frames from which the samples were selected should be similar; and,
- Number of observations in both data sets should be of the same order or magnitude.

These characteristics vary in importance depending on the final use of the data. The closer two data sets are with regard to these characteristics, the more appropriate it will be to compare them. Large differences between characteristics may be of only minor importance, depending on the decision that is to be made from the data.

### A4.3.6 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Field completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project.

The calculation for percent completeness is as follows:

$$\%C = 100\% \times (V/n)$$

%C = percent completeness
V = number of valid measurements
n = number of measurements planned

## A5 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

### A5.1 Purpose/Background

The purpose of this section is to ensure that any specialized training requirements necessary to complete this project are known and described below. In addition, the procedures are described in enough detail to ensure that specific training skills can be verified, documented, and updated as necessary.

### A5.2 Training

Training, as described here, is limited to appropriate training in:

- MS™ Access '97, Fully Integrated Environmental Location Decision Support (FIELDS) software, and Spatial Analysis and Decision Assistance (SADA) software: MPCA Project Manager;
- MS™ Access '97/2000: MESL Environmental Scientist, Research Assistant, and Vice-President; and
- Query Manager 2.5: MESL Environmental Scientist.

### A5.3 Certification

ArcView Certification from ESRI: MPCA Project Manager (ArcView 3.2 and 8.3) and MESL Environmental Scientist (ArcView 3.2; ArcView 8.3 training is pending)

## A6 DOCUMENTATION AND RECORDS

### A6.1 Purpose/Background

Sufficient metadata will be evaluated during the screening of sediment quality and GIS data sets to verify the quality of the data. The screening criteria for evaluating candidate sediment quality data sets is provided in Appendix C.

## A6.2 Data Reporting Package Archiving and Retrieval

The MPCA will retain electronic and paper copies of data reports, screening summaries, and other work products for seven years after the end date of the State of Minnesota's professional and technical services contract with MESL. After seven years, the MPCA Project Manager and Grant Manager (or their designees) will determine if this information needs to be retained for a longer period of time.

# B DATA ACQUISITION

## B1 DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

### B1.1 Purpose/Background

Only previously collected sediment quality data will be included in the Phase II GIS-based sediment quality database for the St. Louis River AOC. These data include the results of various sediment chemistry and particle size analyses, sediment toxicity tests, benthic invertebrate community surveys, sediment bioaccumulation tests, and fish surveys (Table A-3). In addition, GIS watershed data will be obtained from established government, tribal, and/or nonprofit sources.

### B1.2 Acquisition of Non-Direct Measurement Data

A search for sediment quality data from the St. Louis River AOC was previously conducted for the Phase I GIS-based sediment quality database (Smorong and Crane, 2003; Smorong *et al*, 2003b) and for the preparation of proposals to seek funding for the Phase II GIS-based database.

The MPCA Project Manager and/or MESL staff will contact staff at the U.S. Army Corps of Engineers and WDNR for their most recent sediment quality data. Due to the limited budget of this project, collaboration will be sought from the above agencies to provide electronic copies of their data in a format readily accessible to the Phase II GIS-based sediment quality database.

Both internal staff input and stakeholder input will be solicited to develop the order of priority by which sediment quality data will be entered into the Phase II GIS-based sediment quality database. The possible order by which sediment quality data will be entered into the MS™ Access 2000 database is as follows:

- Several U.S. Army Corps of Engineers and their contractor studies of the shipping channels in the Duluth-Superior Harbor; and
- Several WDNR and consultant studies of Hog Island Inlet/Newton Creek, Fraser Shipyards, and Crawford Creek.

There may be insufficient project funds to add all of the above sediment quality data sets to the Phase II MS™ Access 2000 database. In addition, benthic invertebrate community data may not be added to this phase of the project due to a lack of resources.

The inclusion of additional sediment quality data to the database, including benthic invertebrate community data, from the Minnesota side of the St. Louis River AOC will be accomplished through a pending, small grant from Minnesota's Lake Superior Coastal Program to the MPCA. The acquisition of this grant has not been made public yet, and it is dependent on the approval of

the Commissioner of the MDNR and NOAA. In addition, after the MDNR receives their NOAA award, a grant agreement will be developed with the MPCA. The MDNR anticipates that these funds will be available after September 1, 2004, and projects must be completed by December 30, 2005.

All sediment quality data sets will be evaluated according to the screening criteria given in Appendix C and documented in Smorong *et al*. (2003b). The screening process was also designed to be flexible to assure that professional judgment could also be used when necessary in the evaluation process. In this way, it will be possible to include as many data sets as possible and, subsequently, use them to the extent that the data quality and quantity dictates.

The criteria for evaluating candidate data sets was established in consultation with an *ad hoc* Science Advisory Group on Sediment Quality Assessment (which is comprised of representatives of federal, provincial, and state government agencies, consulting firms, and nongovernmental organizations located throughout North America and elsewhere worldwide). Subsequently, MESL staff and the MPCA Project Manager refined these criteria in the Phase I project to specifically apply to data sets that would be incorporated in the GIS-based sediment quality database for the St. Louis River AOC (Appendix C).

The data quality screening procedures outlined in Appendix C are an important first step in evaluating the quality of the data from various sediment quality studies. During this QA/QC process, the methods used for sample collection, handling, and analysis will be scrutinized. The results of the data quality screening process will be entered into a detailed electronic worksheet. Any outstanding data quality issues or questions will be resolved by contacting the study authors. Finally, all decisions and assumptions that will be made relative to data acceptability and data treatment will be approved by the MPCA Project Manager and recorded in electronic forms.

The acquisition of additional GIS shapefiles to augment the Phase I ArcView 3.2 projects will be done to primarily fill data gaps and add new data. In particular, GIS shapefiles for the Superior Port Land Use plan and habitat data from the WDNR for Douglas county will be obtained.

## B2 DATA MANAGEMENT

### B2.1 Purpose/Background

This section will present an overview of all mathematical operations and analyses performed on raw data to change their form of expression, location, quantity, or dimensionality. For this project, these operations include data validation, transmittal, reduction, analysis, management, storage, and retrieval.

## B2.2 Data Validation

All sediment quality data sets will be verified against the original data source. The specific procedures involved in this step of the process are provided in Appendix D (Data Quality Check Sheet for Sediment Quality Data).

Following translation of the data into a database format, the verified data will be further evaluated. This auditing process involves analysis of outliers (i.e., to identify inconsistencies with units) and completeness (i.e., to identify missing samples or missing data); examination of data qualifier fields (i.e., to assure internal consistency); and evaluation of sample identification numbers (i.e., to ensure that data were not duplicated). The data qualifier codes included in the original data files will be incorporated into the MS™ Access 2000 database without carrying out further data validation procedures (i.e., the electronic data source files will not be scrutinized to further evaluate the accuracy and precision of the underlying data).

Data validation of GIS shapefiles obtained from other sources will not be actively validated. Any errors noticed in the shapefiles will be documented in the updated Help Section for ArcView Users, as well as the updated Technical Documentation for this project. If contact information is supplied in the metadata for the shapefile, either MESL staff or the MPCA Project Manager will inform the contact of the error.

## B2.3 Data Transmittal

Data transmittal occurs when data are transferred from one person or location to another or when data are copied from one form to another. Some examples of data transmittal are copying raw data from a notebook onto a data entry form for keying into a computer file and electronic transfer of data over a computer network. The MPCA Project Manager will verify the transmittal of electronic data files to MESL. The QA/QC procedures for verifying translated sediment quality data from spreadsheet into MS™ Access 2000 format and for verifying manually entered data are provided in Appendix D.

The MESL Environmental Scientist and MPCA Project Manager will perform spot checks of data contained within GIS shapefiles to ensure these data have been correctly incorporated into the ArcView 3.2 projects. Additional spot checks will be conducted when the ArcView 3.2 projects are translated to ArcView 8.3.

## B2.4 Data Reduction

Data reduction includes all processes that change the number of data items. For the toxicity tests and bioaccumulation studies, data reduction will involve taking the arithmetic mean of replicate data (e.g., number of surviving organisms). For the analytical results, data reduction will involve calculating the arithmetic mean of analytical duplicates. Some data reduction (to be determined)

will be necessary if benthic invertebrate community data are added to the MS™ Access 2000 database in order to save file storage space in the database.

### B2.5 Data Analysis

Data analysis will involve calculating the mean PEC-Qs for surficial sediment sites in the St. Louis River AOC using the methods that were recommended by Ingersoll *et al*. (2001) and outlined in Crane *et al*. (2000). MESL staff will update a technical memorandum for the Phase I project that compared the mean PEC-Qs for surficial sediments in the St. Louis River AOC with mean PEC-Qs for other freshwater surficial sites in the Great Lakes region and in North America. This task will involve the use of MESL's proprietary sediment toxicity database of matching sediment chemistry and toxicity data for freshwater sites in North America.

The specific procedures by which total PAHs, total low molecular weight PAHs, total high molecular weight PAHs, total PCBs, and total DDTs will be calculated are provided in the Technical Documentation for the Phase I GIS-based database (Smorong *et al*., 2003b). The World Health Organization (WHO) Toxic Equivalency Factors (TEFs) for humans (HH) will be used to calculate TEQ_HH, and the WHO TEFs for fish (W) will be used to calculate TEQ_W (van den Berg *et al*., 1998). TEQs will not be calculated for samples that only have results for PCB congeners.

### B2.6 Data Tracking

The MPCA Project Manager and MESL staff will track the status of entering data into the Phase II GIS-based sediment quality database by updating an Excel spreadsheet developed for the Phase I project.

### B2.7 Data Storage and Retrieval

The MPCA will retain all the analytical and bioeffects data packages in the project files for this study. The time period for storage of MPCA files was given in Section A6.2.

# C ASSESSMENT/OVERSIGHT

## C1 ASSESSMENT

### C1.1 Purpose/Background

During the planning process, several options for data fields, types of sediment quality data, data reduction procedures, and GIS watershed data will be evaluated for possible inclusion in the GIS-based sediment quality database. In order to ensure that population of the database with sediment quality data and addition of GIS shapefiles to the ArcView 3.2 projects are conducted as planned, a process of evaluation and validation is necessary. This section of the QAPP describes the internal and external checks necessary to ensure that:

- All elements of the QAPP are correctly implemented as prescribed;
- The quality of the sediment quality data included in the MS™ Access 2000 database is adequate;
- The quality of the GIS shapefiles included in the ArcView 3.2 and 8.3 projects is adequate; and,
- Corrective actions, when needed, are implemented in a timely manner and their effectiveness is confirmed.

The most important part of this section is documenting all planned internal assessments of the Phase II GIS-based sediment quality database. The MESL Environmental Scientist will initiate internal assessments.

### C1.2 Assessment Activities and Project Planning

#### C1.2.1 Assessment of the Subsidiary Organizations

Two types of assessments of the Contractor can be performed as described below.

- *Management Systems Review (MSR).* A form of management assessment, this process is a qualitative assessment of an organization to establish whether the prevailing quality management structure, policies, practices, and procedures are adequate for ensuring that the type and quality of data needed are obtained. The MSR is used to ensure that sufficient management controls are in place and carried out by the organization to adequately plan, implement, and assess the results of the project.
- *Readiness Reviews.* A readiness review is a technical check to determine if all components of the project are in place so that work can commence on a specific phase.

It is anticipated that a readiness review of the Contractor, by the MPCA Project Manager, will be sufficient for this project.

### C1.2.2 Assessment of Project Activities

For this project, it is anticipated that surveillance will be the primary assessment technique of project activities by the Contractor. This will most readily occur by the Project Manager of MESL.

## C1.3 Documentation of Assessments

### C1.3.1 Number, Frequency, and Types of Assessments

The MESL Project Manager and MPCA Project Manager will only conduct general surveillance types of assessments as work products are completed or questions arise.

### C1.3.2 Assessment Personnel

The Contractor will provide internal verification of sediment quality data that are translated from MS™ Excel data files to the Phase II GIS-based sediment quality database.

### C1.3.3 Schedule of Assessment Activities

The MPCA Project Manager or QA Coordinator will not conduct any external QA/QC audits for this project. External audits, by the GLNPO QA Officer, are up to his discretion.

### C1.3.4 Reporting and Resolution of Issues

Any audits or other assessments that reveal findings of practice or procedure that do not conform to the written QAPP need to be corrected as soon as possible. For noncritical deviations, the MPCA Project Manager needs to be informed by the next business day.

Corrective actions should only be implemented after approval by the MPCA Project Manager. If immediate corrective action is required, approvals secured by telephone from the MPCA Project Manager should be documented in an additional memorandum.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem will be responsible for notifying the MPCA Project Manager, who in turn will notify the MPCA Grant Manager who will inform the GLNPO Project Officer. Implementation of corrective actions will be confirmed in writing through the same channels.

Any nonconformance with the established quality control procedures in the QAPP will be identified and corrected in accordance with the QAPP. The GLNPO Project Officer, or his designee, will issue a nonconformance report for each nonconformance condition.

Any corrective actions will be performed prior to release of the Phase II GIS-based sediment quality database from the contractor. The corrective actions will be documented in a memorandum to the MPCA Project Manager and Grant Manager.

## C2 REPORTS TO MANAGEMENT

### C2.1 Purpose/Background

This section will identify the frequency and distribution of reports issued to inform management of the status of the project, including QA/QC issues.

### C2.2 Frequency, Content, and Distribution of Reports

The MPCA Project Manager will submit quarterly reports to the MPCA Grant Manager for the quarters ending on June 30, 2004, September 30, 2004, and December 30, 2004. The contractor will need to submit a short project update to the MPCA Project Manager by these same dates. The progress updates can be sent to the MPCA Project Manager via email and need to document progress on tasks identified in the contractor's contract with the State of Minnesota. In addition, any problems encountered should be documented, and plans for the next quarter need to be identified.

### C2.3 Identify Responsible Organizations

Any serious QA problems needing immediate decisions will be discussed orally between MPCA personnel and contract staff, with such discussions denoted in writing; these problems will be noted in the quarterly reports to the MPCA Grant Manager.

The contractor will document QA procedures (e.g., data verification) conducted for this project as part of an updated Technical Documentation report (i.e., update of Smorong *et al*., 2003b).

# D DATA VALIDATION AND USABILITY

## D1 DATA REVIEW, VALIDATION, AND VERIFICATION REQUIREMENTS

### D1.1 Purpose/Background

The purpose of this section is to state the criteria for deciding the degree to which each data item has met its quality specifications as described in Section B. The potential effect that each deviation from the QAPP may have on the usability of the associated data item, its contribution to the quality of the reduced and analyzed data, and its effect on the decision should be estimated.

### D1.2 Data Reduction and Processing

Checks on data integrity evaluate the accuracy of "raw" data and include the comparison of important events and the duplicate rekeying of data to identify data entry errors.

Data reduction is an irreversible process that involves a loss of detail in the data and, for this project, will involve averaging across space (e.g., averaging results from analytical duplicates). Analytical results for sediment samples will be calculated and reported on a dry weight basis.

Any manipulations of the data (e.g., calculation of mean PEC-Qs, total PCBs, total PAHs, etc.) will be double-checked that the formulas to make these calculations were set up correctly.

## D2 VALIDATION AND VERIFICATION METHODS

### D2.1 Purpose/Background

The purpose of this section is to describe, in detail, the process for validating (determining if data satisfy QAPP-defined user requirements) and verifying (ensuring that conclusions can be correctly drawn) project data. The amount of data validated is directly related to the DQOs developed for the project.

### D2.2 Process for Validating and Verifying Data

Since all of the sediment quality and fisheries data, as well as GIS-based watershed data, will come from other sources, it is beyond the scope of this project to validate all of these data. The MPCA have already validated data collected as part of their GLNPO and EPA grants of the past fourteen years (per the requirements of the respective QAPPs for each project).

For this project, the transfer of data to the Phase II GIS-based sediment quality database will be validated to ensure that no transcription errors are made (Appendix D). The MPCA Project Manager will respond to any contractor questions to verify the data.

## D3 RECONCILIATION WITH DATA QUALITY OBJECTIVES

### D3.1 Purpose/Background

The purpose of this section is to outline and specify, if possible, the acceptable methods for evaluating the results obtained from the project. This section includes scientific and statistical evaluations of data to determine if the data are of the right type, quantity, and quality to support their intended use.

### D3.2 Reconciling Results with DQOs

Data quality assessment (DQA) follows the data validation and verification steps. As such, DQA determines how well the validated data can support their intended use. The MPCA Project Manager will evaluate the data to determine if it will meet the data quality objectives specified in Section A4.

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# APPENDIX A

# ROLES AND RESPONSIBILITIES IN MPCA GRANTS ADMINISTRATION

# ROLES AND RESPONSIBILITIES IN AGENCY GRANTS ADMINISTRATION

## MPCA GRANTS REDESIGN

**Grant Manager (GM)** (fiscal/administrative expertise)

- Creates grant application with support from Project Manager (PM), Agency Grants Coordinator (AGC), and Fiscal Coordinator (FC)
  - Responsible for pre-application and application process, fills out all required forms and routes
  - Works with PM and FC to develop budget detail for application and spending plan for fiscal years
- Coordinates fiscal aspects of the grant (MAPS, state-match allotments, etc.) with PM and FC
- Contributes to the development of Biennial Budget System and Annual Spending Plans with FC
- Coordinates grant tracking with Agency Grants Coordinator
- Coordinates with AGC to set up and maintain official agency file
  - Includes all official correspondence, and fiscal and programmatic reports
- Responsible for maintaining communication with Grant Champion (GC) and Project Manager
- Knowledgeable of program requirements in grant
- Responsible for grant requirements and special conditions being met
- Attends required quarterly meetings with Fiscal Coordinator
- Prepares and submits quarterly MBE/WBE report with support from FC to AGC
- Reviews and approves quarterly financial reports – communicates with PM, FC and GC, as appropriate
- Responsible for maintaining fiscal integrity of grant program
- Develops LAC and Policy Notes with assistance of Project Manager, Fiscal Coordinator and AGC
- Responsible for satisfying grant Closeout requirements – program and fiscal - within 90 days of grant budget period end date, with support from Agency Grants Coordinator

**Project Manager (PM)** (program expertise)

- Assists Grant Manager in creating the grant application
- Manages day-to-day grant/project work
- Coordinates grant activities with technical personnel and Grant Manager
- Ensures MBE/WBE compliance – knowledgeable of contractors MBE/WBE status prior to engagement
- Responsible for program procurement (e.g. contracts and supplies)
- Develops the grant's workplan (scope of work, statement of work, plan for grant activities, etc.)
- Implements workplans and completes required technical reports
- Responsible for scope of work as outlined in the grant workplan
- Develops Quality Assurance Project Plan for data collection and/or data management (e.g., database) projects, if applicable
- Responsible for overseeing the archival of environmental data in agency-approved databases (including federal databases from granting organization), if applicable

**(Please note that there may be instances where one person performs both Grant Manager and Project Manager roles.)**

## Grant Champion – Section Manager Level (GC)

- Involved in decision of whether to apply for funds through pre-application and amendment processes
  - For example, Does the grant align with agency and section priorities? Does the section's work plan reflect the level of effort necessary to meet the grant's proposed objectives?
- Grant Champion cannot delegate their decision making authority
- Receives high level budget issues from Grant Manager (GM) and communicates with others
  - Brings high level issues to the fiscal system management team & other appropriate persons
- Responsible for managing necessary links between other divisions and issue lead teams
- Attends quarterly grant meetings with GM and Fiscal Coordinator (FC), where appropriate
- Evaluates grant for work done to meet outcome accountability and ensures that resources are dedicated to work commitments
- Communicates to Supervisors to limit competing resources (give time to closeouts, final reports, etc.)
- Coordinates audit with Fiscal Services Division
- Acts as primary EPA contact for big picture program-area issues
- Reviews related BBS information and information from fiscal system management team
- Is person responsible for program and fiscal requirements being met

## Agency Grants Coordinator (AGC – Joshua Bunker)

- Coordinates and standardizes agency-wide grant administration
- Holder of MPCA grant policies and procedures
- Provides grant management training (fiscal and grant)
- Sees the big picture and flags problems
- Reviews applications for completeness, reviews award letters and acceptances, and signs off
- Central point person for new federal money
  - Searches federal register, EPA Web site and other resources on a regular basis to find new federal funding, and notifies agency personnel as appropriate
- Responsible for annually-required certifications (works with Fiscal Services Division)
- Serve as lead agency representative on EPA grants management work group
- Coordinator for agency-wide MBE/WBE reporting
- Agency contact for and ensures compliance with EPA and other federal regulations
  - Knowledge of federal regulations across media
- Establishes and maintains grant tracking system (data base)
- Works with Grant Managers on:
  - Identifying funding opportunities
  - Pre-application, application, amendments and approval processes
  - Filing of grant-related information
  - Meeting with grant teams (GM and FC) on quarterly basis, where appropriate
  - Grant Closeouts
- Completes final review of Policy Note and Legislative Advisory Commission Request (LAC) prior to submittal to Fiscal Services Division
  - Provides assistance to Grant Manager on requirements to complete needed forms
  - Coordinates the completion of Policy Note and LAC forms with GM and FC
- Liaison with EPA concerning agency-wide grants activities (coordinates monthly EPA conference call)
- Responsible for Biennial Budget System information
  - Compiling/completing federal fund summary reports, narratives, etc.
  - Coordinates the development of federal revenue budgets
- Provides technical assistance to Grant and Project Managers to ensure reasonable budgets are developed (state-match requirements met, equipment is documented, etc.)

- Acts as resource for Grant Managers, Project Managers and Grant Champions on grants processes, procedures and reporting requirements

**Fiscal Coordinator (FC – John Allen, Linda Carroll, Susan Jaeger, Leigh Jorento, or Joel Marquardt)**

- Provides support in pre-application and application and amendment processes
  - Determines match dollars, source, indirect rate, fringe rate, FTE projections, inflation, etc.
  - Signs off on application and award
- Provides technical support during operation of grants
  - Coordinates information with Fiscal Services Division to establish appropriation, revenue budget, federal/state match, etc., with Grants Managers and AGC
  - Loads grant budget into agency/state budget system
  - Track who gets paid by what (salary, S&E spreadsheet, etc.)
  - Attends required quarterly meetings on grants with Grant Managers: formally reviews financial status reports and history of expenditures, and addresses issues
  - Makes ongoing budget adjustments as directed by Grant Managers
  - Assists with the preparation and maintenance of annual spending plans (works with GMs and PMs on preparation of internal budgets)
  - Supports Grant Managers in Closeout process
- Biennial Budget System and Annual Spending Plans
  - Develops federal revenue budgets in coordination with Grant Managers
  - Responsible for knowledge of fiscal information in Biennial Budget System
- Collects quarterly MBE/WBE information from Grant Managers
  - Prepares quarterly media summary and submits to AGC
- Assists on grants manual creation and grants administration training
- ***Monitors and reviews monthly financial reports***
- Assists Grant Manager with Policy Note and LAC preparation

**Section Manager (SM)** – (Supervisor of Supervisor where the work is being done)

- Communicates with Grant Champion on priorities
- Supports grant workplans and incorporates into the section workplan
- Presents higher level budget issues to the Grant Champion

**Supervisor (S) –** (Supervisor where the work is being done)

- Provides support in pre-approval, amendment and approval processes – signs off on application
- Creates, with staff, the unit and individual's workplans to align work with grant workplan
- Reviews time sheets and expense reports to ensure use of proper funds (allotment strings)
- Ensures that grant funds are only used for grant-specific work
- Communicates with GC and SM on high level changes and other issues (e.g., agency priority changes)
- Reviews grant progress reports – technical

**PPG Coordinator (PPGC – Linda Carroll)**

- Same roles/responsibilities as Grant Manager, but for the PPG
- Assembles PPG guidance
- Knowledge of applicable federal regulations
- Assembles quarterly review of PPG with Grant Champion, EnPPA and media program leads
  - Discuss grant status to date, program and fiscal activity, challenges, etc.
- Creates grant application with support from Project Manager
  - Responsible for application process, fills out all required forms and routes
  - Works with PM to develop budget detail for application and spending plan for fiscal years
- Participates in monthly EPA conference calls
- Responsible for maintenance of PPG files
- Coordinates grant reporting information for PPG with Agency Grants Coordinator
- Responsible for MBE/WBE reporting – prepares and submits to AGC
- Coordinates discussion for scope of EnPPA with appropriate agency personnel
- Liaison with EPA on PPG grant issues, part of conference calls as needed for non-PPG programs
- Knowledge of federal regulations across media

**Agency Grants Reporting Coordinator (Lita Johnson)**

- Develops and distributes quarterly FSRs, and provides to GM, PM and FC for formal review
- Develops federal indirect cost rate with Budget Manager
- Tracks letters of credit
- Manages federal grant draw downs
- Establishes and maintains MAPS federal grants module
- Prepares single audit reports
- Maintains fiscal federal grants file
- Closeout coordinator and EPA contact

**Financial Data Management Analyst (Kim DeVeau)**

- Sets up appropriation, allotment and revenue budgets
- Provides financial analytical support as needed

**Budget Manager (Kathy Sather)**

- Link to DOF on Policy Note submittal and coordination with AGC to get forms completed
- Reviews and approves grant document
- Knowledgeable of federal financial management regulations
- Agency's authorized representative to approve FSRs
- Coordinates agency's Biennial Budget System for federal funds
- Approves draw downs and federal cash transactions
- Develops agency indirect rate – coordinates with fiscal systems management team to determine options for indirect cost development for Senior Managers Team approval
- Participates in EPA regional grants management work group
- Coordinates audit with Agency Grants Coordinator and Grant Champions

**Accounts Payable Transaction Specialists (Jeanette Burfeind and Carl Agerbeck)**

- Prepares draw downs for EPA

# APPENDIX B

# SUMMARY OF GIS DATA COMPILED FOR THE VARIOUS ARCVIEW 3.2 PROJECTS FOR THE PHASE I PROJECT

**Table B-1. Summary of GIS Data Compiled for the Contaminated Areas Project**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\.... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Contaminated Areas** | Contaminated Sediment Hot Spots | Location of hot spot sites (i.e., areas of high sediment contaminant concentrations). | MPCA (Crane *et al.* 1997) | Crane *et al.* 1997 | Shapefile created by MESL | hotspots.shp | Contaminated_Areas\ Hotspots | NA | YES |
| | Superfund Sites | Location of CERCLA Superfund Sites. | MPCA | IT Corp. 1997; URS Corp. 2002 | Shapefile created by MESL | superfund.shp | Contaminated_Areas\ Superfund_Sites | NA | YES |
| **Facilities/ Point Sources** | Location of Feedlots (MN) | Location of feedlots. | -- | MPCA | GIS data sent by MPCA (Tad Schindler) | feedlots.shp | Contamination_Points\ Feedlots | Users have no basis for interpreting attribute data (GIS data provides location data only). | NO |
| | Hazardous Waste Generators (MN) | In Minnesota, commercial entities that produce any amount of hazardous waste are regulated as hazardous-waste "generators" with requirements that depend upon the amount of waste they produce. | MPCA | MPCA | GIS data sent by MPCA (Tad Schindler) | hwgen.shp | Contamination_Points\ Hazardous_Waste_Generators | Users have no basis for interpreting attribute data (e.g., Type, Size and LCM fields). Refer to www.pca.state.mn.us/programs/bau_p.html for more information about the program. | NO |
| | Industrial Facilities | Industrial Facilities Discharge Sites - these sites are industrial or municipal point sources discharging to surface waters. | USEPA/Office of Water/OST | USEPA 2003 | BASINS website | ifdgood.shp | Contamination_Points\ Industrial_Facilities | Users will need to refer to the metadata file to interpret the field names in the attribute table. | YES |

**Table B-1. Continued.**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\.... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Facilities/ Point Sources (cont.)** | Landfills (MN) | Location, type, and status of landfill sites. | -- | MPCA | GIS data sent by MPCA (Tad Schindler) | landfills.shp | Contamination_Points\ Landfills | Users have no basis for interpreting attribute data in the 'Rank' field. | NO |
| | Leaking Underground Storage Tanks (MN) | Location and status of LUSTs. | -- | MPCA | GIS data sent by MPCA (Tad Schindler) | lust.shp | Contamination_Points\ Leaking_Underground_Storage_Sites | Users have no basis for interpreting attribute data in the 'LCM' field. | NO |
| | Oil Storage Facilities (# of oil tanks) | Location, contact information and product type/volume of oil storage facilities. | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | fixed oil storage facilities_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA | YES |
| | Permit Compliance System | USEPA-regulated facilities listed in the USEPA Envirofacts Permit Compliance System (PCS) database. | USEPA | USEPA 2003 | BASINS website | permitcomp_final_utm.shp | Contamination_Points\ Permit_Compliance_System | Users have no basis for interpreting attribute data in several fields because metadata does not provide code descriptions (GIS data provides location and facility names only; Envirofacts database can be referenced for code descriptions). | YES |
| | Pipelines | Locations and routes of pipelines carrying crude oil or refined oil products. | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | pipelines_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |

**Table B-1. Continued.**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\.... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Facilities/ Point Sources (cont.)** | Resource Conservation and Recovery Information | USEPA-regulated facilities listed in the USEPA Envirofacts Resource Conservation and Recovery Information System (RCRIS; a system in which information is provided by generators, transporters, treaters, storers, and disposers of hazardous waste to state environmental agencies). | USEPA | USEPA 2003 | BASINS website | rcris_final_utm.shp | Contamination_Points\ Resource_Conservation_and_ Recovery_Information | Users have no basis for interpreting attribute data in several fields because metadata does not provide code descriptions (GIS data provides location and facility names only; Envirofacts database can be referenced for code descriptions). | YES |
| | Toxic Release Inventory Sites | USEPA-regulated facilities listed in theToxic Release Inventory System (TRIS). | USEPA | USEPA 2003 | BASINS website | tri_final_utm.shp | Contamination_Points\ Toxic_Release_Inventory_Site | Users have no basis for interpreting attribute data in several fields because metadata does not provide code descriptions (GIS data provides location and facility names only; Envirofacts database can be referenced for code descriptions). | YES |
| | Salvage Yards (MN) | Location, licensing information, facility descriptions and inspection information for salvage yards. | -- | MPCA | GIS data sent by MPCA (Tad Schindler) | salvage.shp | Contamination_Points\ Salvage_Yards | Users have no basis for interpreting attribute data in several of the fields (i.e., ps_lic, dism_cov). | NO |

**Table B-1. Continued.**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\.... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Discharges/ Emissions** | Air Emissions (MN) | Location and names of facilities with air emissions, and contaminant concentrations in air emissions. | MPCA (data obtained from Chun Yi Wu) | MPCA 1999 | Shapefile created by MESL | airemissions.shp | Contamination_Points\ Air_Emissions | Users to note that the units of contaminant concentrations in air emissions are lbs. | YES |

BASINS = Better Assessment Science Integrating Point and Nonpoint Sources; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; GIS = Geographic Information System; LUST = Leaking Underground Storage Tanks; MESL = MacDonald Environmental Sciences Ltd.; MN = Minnesota; MPCA = Minnesota Pollution Control Agency; NA = Not Applicable; OST = Office of Science and Technology; PCS = Permit Compliance System; RCRIS = Resource Conservation and Recovery Information System; TRIS = Toxic Release Inventory System; USEPA = United States Environmental Protection Agency.

**Table B-2. Summary of GIS Data Compiled for the Ecological Areas Project**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Ecological Sites** | Environmentally Sensitive Areas[1] | Special places meriting spill protection (areas not publicly managed, with no special designation). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | envirosensres_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Habitat Sites | Location of sites of important habitat in the Lake Superior Basin, mapped as part of the Lake Superior Binational Program. | MN DNR | UMN and NRRI 2003 | Lake Superior Decision Support Project website | habitatsites_utm.shp | Ecological_Areas_and_Classification\ Habitat_Sites | Users will need to refer to the metadata file to interpret the field names in the attribute table. Link to file referred to in the metadata file doesn't work. | YES |
| **Lower St. Louis River Habitat Plan** | Lower St. Louis River Habitat Plan Aquatic Habitat | Aquatic habitat types within the Lower St. Louis River, from the Fond du Lac Dam to the Duluth and Superior entries to Lake Superior (established by the MN DNR and the WI DNR). | Community GIS Services, Inc. | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | aquatic_habitat.shp | Lower_STLR_Habitat_Plan\ Aquatic_Habitats | NA | YES |
| | Lower St. Louis River Habitat Plan Plant Communities | Plant community types within a quarter mile buffer of the Lower St. Louis River, from the Fond du Lac Dam to the Duluth and Superior entries to Lake Superior (established by the MN DNR, the WI DNR, and CGIS). | Community GIS Services, Inc. | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | plant_communities.shp | Lower_STLR_Habitat_Plan\ Plant_Communities | NA | YES |

**Table B-2. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Lower St. Louis River Habitat Plan (cont.)** | Lower St. Louis River Habitat Plan Project Area | Project area of St. Louis River. | -- | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | project_area.shp | Lower_STLR_Habitat_Plan\Project_Area | NA | NO |
| **Managed Areas** | Managed Areas[1] | Boundaries of federal, state, regional and private lands with special ecological, natural, or recreational value, which are uniquely vulnerable to oil spills (mapped for the Western Lake Superior Inland Sensitivity Atlas). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | managed resource areas_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | MN DNR Scientific and Nat. Areas | Location of Scientific and Natural Areas (SNAs) delineated under the SNA Program (MN DNR). | MN DNR - Scientific and Natural Areas Program | MDNR 2003a | Minnesota DNR GIS Data Deli website | snaxxpymn.shp | Ecological_Areas_and_Classification\MN_DNR_Scientific_and_Natural_Areas | NA | YES |
| **Vegetation** | PLS Presettlement Vegetation (MN) | General location of bearing trees used in conjunction with the original Public Land Survey (PLS; 1908) and information on vegetation type information. | MN DNR - Section of Wildlife - Minnesota County Biological Survey | MDNR 2003a | Minnesota DNR GIS Data Deli website | pls_veg.shp | Ecological_Areas_and_Classification\PLS Corners with Presettlement Vegetation Info | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |

**Table B-2. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Mussel Distribution** | USGS Zebra Mussel Distribution (1989-1998) | Compilation of reports of confirmed zebra mussel sightings in the United States from 1988 to the present (from a variety of federal, State, and municipal agencies, public utilities, universities, engineering and private consultant firms). | USGS, Florida Caribbean Science Center | USGS 2003a | The National Atlas of the USA website | zebra_mussels.shp | Ecological_Areas_and_Classification\Zebra_Mussel_Distribution | NA | YES |
| | MN DNR Mussel Sites 1991, 2000, 2002 | Location of state- and/or federally-listed mussels. | MN DNR - Natural Heritage Program | MPCA | GIS data sent by MPCA (Judy Crane via Sarah Hoffman) | stl_musselsites_1991.shp; stl_musselsites_2000.shp; stl_musselsites_2002.shp | Ecological_Areas_and_Classification\Mussels | It is unclear what these data represent, based on the current information and metadata available. Refer to http://www.dnr.state.mn.us/ecological_services/nhnrp/mussel_survey/index.html for more information about the data. | YES |

ATV = All Terrain Vehicle; CAC = Citizens Action Committee; CD = Compact Disc; CGIS = Community GIS Services, Inc.; DNR = Department of Natural Resources; GIS = Geographic Information System; MN = Minnesota; MPCA = Minnesota Pollution Control Agency; NA = Not Applicable; NRRI = Natural Resources Research Institute; PLS = Public Land Survey; SNAs = Scientific and Natural Areas; UMN = University of Minnesota; USA = United States of America; USEPA = United States Environmental Protection Agency; USGS = United States Geological Survey; WI = Wisconsin; WWW = World Wide Web.

1 These shapefiles only contain natural heritage data from Minnesota DNR. Wisconsin DNR natural heritage information was not included at the request of the Wisconsin DNR.

**Table B-3. Summary of GIS Data Compiled for the Geographic Features Project**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Geography** | Geographical Names (MN) | Names of all places, features, and areas which appear on the USGS 7.5-minute quadrangle map series (from the National Geographic Names Data Base). | USGS | MDNR 2003a | Minnesota DNR GIS Data Deli website | geonames.shp | Geographic Features\Geography | Users note that codes can be accessed on web through the metadata file (Section 5 - HTML Table). | YES |
| **Landforms** | Landforms (MN) | Geomorphology data describing a wide variety of conditions related to surficial geology. | University of Minnesota-Duluth Geology Department; MN Geological Survey, MN DNR | MDNR 2003a | Minnesota DNR GIS Data Deli website | landforms.shp | Geographic Features\Landforms | Users note that codes can be accessed on web through the metadata file (Section 5 - HTML Table). | YES |
| **Soils** | Soils | State Soil Geographic (STATSGO) database: digital general soil association map developed by the National Cooperative Soil Survey. | USEPA | USEPA 2003 | BASINS website | statsgo_utm.shp | Geographic Features\Soils | Users note that 2 additional tables with soils data can be referred to based on MUID # (included under tables). | YES |

BASINS = Better Assessment Science Integrating Point and Nonpoint Sources; DNR = Department of Natural Resources; GIS = Geographic Information System; HTML = HyperText Markup Language; MN = Minnesota; NA = Not Applicable; STATSGO = State Soil Geographic Database; USEPA = United States Environmental Protection Agency; USGS = United States Geological Survey.

**Table B-4. Summary of GIS Data Compiled for the Hydrology Project**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Hydrologic Units** | USGS Hydrologic Management Units | Hydrologic Units (USGS Office of Water Data Coordination), which includes the list descriptions and name of region, subregion, accounting units, and cataloging unit. | Steeves, Peter and Douglas Nebert | USGS 2003b | Water Resources of the United States website | huc04_250K_utm.shp | Hydrology\Hydrologic_Units | NA | YES |
| **Lakes** | MN DNR Lakes | MN DNR 24,000K Lakes (medium scale lake polygons derived from the National Wetlands Inventory (NWI) polygons and MNDOT Basemap lake delineations, integrated with the DNR 24K Streams Layer). | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | dnrlkpymaj03.shp | Hydrology\Lakes\DNR_24K_Lakes | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |
| | USGS DLG Lakes and Wetlands (MN) | 1:100,000 scale hydrography (lakes only) derived from USGS Digital Line Graph's (DLG's) of the same scale. | USGS | MDNR 2003a | Minnesota DNR GIS Data Deli website | dlglkpystlo.shp | Hydrology\Lakes\DLG_Lakes_and_Wetlands_Polygons | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |
| **Streams/Rivers** | Duluth Trout Streams | Designated trout streams of Duluth (as reported by Duluthstreams.org). | MESL | DuluthStreams 2003 | Shapefile created by MESL | dulutroutstreams.shp | Hydrology\Streams_Rivers\Duluth Trout Streams | NA | YES |

**Table B-4. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Streams/Rivers (cont.)** | Land Areas of the St. Louis River | Location of islands, points, etc. (to support the navigation of vessels). | NOAA, National Ocean Service, Office of Coast Survey | NOAA 2003a | Electronic Navigational Charts Download website | land_region_polygon_utm.shp | Hydrology\Streams_Rivers\Land Areas… | Users have no basis for interpreting attribute data because metadata does not define the information contained in the attribute fields (GIS data provides location data only). Metadata for this data is unreliable (see readme file). | YES |
| | USGS DLG MN Streams (extra coverage) | 1:100,000 scale hydrography (rivers and streams only) derived from USGS DLG's of the same scale. | USGS | MDNR 2003a | Minnesota DNR GIS Data Deli website | dlgstlnstlo.shp | Hydrology\Streams_Rivers\DLG_Streams_MN | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |
| | MN and WI Streams | Location of small to medium size streams (ESRI shapefile). | ESRI | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | streams_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA | YES |
| | Trout Streams and Resource Waters | Special designated resource areas that are uniquely vulnerable to oil spills (mapped for the Western Lake Superior Inland Sensitivity Atlas). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | special designated resource areas_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA | YES |

**Table B-4. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Streams/Rivers (cont.)** | Water Bodies of the St. Louis River | Location of bays, lakes, etc. (to support the navigation of vessels). | NOAA, National Ocean Service, Office of Coast Survey | NOAA 2003a | Electronic Navigational Charts Download website | water_area_utm.shp | Hydrology\Streams_Rivers\Water_Areas_St. Louis River | Users have no basis for interpreting attribute data because metadata does not define the information contained in the attribute fields (GIS data provides location data only). Metadata for this data is unreliable (see readme file). | YES |
| **Watersheds** | WI Watersheds | Watersheds of WI. | -- | WDNR 2003 | WI DNR FTP site | wiwatsheds.shp | Hydrology\Watersheds\Watersheds_WI | NA | YES |
| | MN Watersheds | Statewide minor watershed delineations with major/minor watershed identifiers and names for provinces, major watersheds, and basins. | MN DNR - Division of Waters | MDNR 2003a | Minnesota DNR GIS Data Deli website | mnwatersheds.shp | Hydrology\Watersheds\Watersheds_MN | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |
| | FEMA Floodways (MN) | Federal Emergency Management Agency (FEMA) floodways [Q3 Flood Data derived from the Flood Insurance Rate Maps (FIRMs)]. | Federal Emergency Management Agency (FEMA) | MDNR 2003a | Minnesota DNR GIS Data Deli website | femafloodways.shp | Hydrology\Watersheds\FEMA_Floodways | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |

**Table B-4. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Water Boundaries (St. Louis River)** | St. Louis River Depths | Water depths (to support the navigation of vessels). | NOAA, National Ocean Service, Office of Coast Survey | NOAA 2003a | Electronic Navigational Charts Download website | depth_area_polygon_utm.shp | Hydrology\St._Louis_River_Boundaries\Depths_Polygon | Users have no basis for interpreting attribute data in some of the fields (e.g., prim, grup, river, ruin) because metadata does not define the information contained in the attribute fields. There is no information available concerning how depth data was obtained and what datum it is relative to. Data presentation assumes that "Drval1" represents water depth and is more relevant than "Drval2". Metadata for this data is unreliable (see readme file). | YES |
| | St. Louis River Outline | Boundary of St. Louis River (line). | -- | MPCA | GIS data sent by MPCA (Judy Crane) | stlouidl_utm.shp | Hydrology\St._Louis_River_Boundaries\River_Outline | NA | NO |
| **Wetlands (Water Features)** | National Wetlands Inventory - Lines | Linear wetland features (including selected streams, ditches, and narrow wetland bodies) mapped as part of the National Wetlands Inventory (NWI). | MN - Division of Waters | MDNR 2003a | Minnesota DNR GIS Data Deli website | nwilines.shp | Hydrology\National_Wetlands_Inventory_Lines | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |

**Table B-4. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Wetlands (Water Features; cont.)** | National Wetlands Inventory - Points | Wetland point features (typically wetlands that are too small to be as area features at the data scale) mapped as part of the National Wetlands Inventory (NWI). | MN - Division of Waters | MDNR 2003a | Minnesota DNR GIS Data Deli website | nwipoints.shp | Hydrology\National_Wetlands_Inventory_Points | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |
| | National Wetlands Inventory - Polygons | Wetland area features mapped as part of the National Wetlands Inventory (NWI). | MN - Division of Waters | MDNR 2003a | Minnesota DNR GIS Data Deli website | nwipolys.shp | Hydrology\National_Wetlands_Inventory_Polygons | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |

DLG = Digital Line Graph; DNR = Department of Natural Resources; ESRI = Environmental Systems Research Institute; FEMA = Federal Emergency Management Agency; FIRMs = Flood Insurance Rate Maps; ftp = File Transfer Protocol; GIS = Geographic Information System; HTML = HyperText Markup Language; MESL = MacDonald Environmental Sciences Ltd.; MIS = Management Information Services; MN = Minnesota; MNDOT = Minnesota Department of Transportation; MPCA = Minnesota Pollution Control Agency; NA = Not Applicable; NOAA = National Oceanic and Atmospheric Administration; NWI = National Wetlands Inventory; USEPA = United States Environmental Protection Agency; USGS = United States Geological Survey; WI = Wisconsin; WWW = World Wide Web.

**Table B-5. Summary of GIS Data Compiled for the Land Use Project**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available ? |
|---|---|---|---|---|---|---|---|---|---|
| **Harbor Facilities** | Harbor Facilities | Industrial harbor facilities (to support the navigation of vessels). | NOAA, National Ocean Service, Office of Coast Survey | NOAA 2003a | Electronic Navigational Charts Download website | harbor_facilities_points_utm.shp | Land_Use_Information\Harbor_Facilities | Users have no basis for interpreting attribute data in several fields because metadata does not define the information contained in the attribute fields (GIS data provides location and facility names only). Metadata for this data is unreliable (see readme file). | YES |
| **Land Cover/Use** | General Land Use/Cover | Land Cover/Use (Duluth Area). | USEPA/Office of Water/OST | USEPA 2003 | BASINS website | l_dulumn_utm.shp | Land_Use_Information\Lands_Cover_and_Use\Land Cover_Use (Duluth Area) | NA | YES |
| | Land Ownership | Public/private ownership as designated by NRRI (includes a breakdown of public ownership by agency, and also includes private industrial forest holdings). | Natural Resources Research Institute | UMN and NRRI 2003 | Lake Superior Decision Support Project website | landown_utm.shp | Land_Use_Information\Lands_Cover_and_Use\Public_Private_Ownerships | NA | YES |
| | Land Use 1800s | Industrial land use along the lower St. Louis River for the pre-industrial time period. | Community GIS Services, Inc. | Kellner *et al.* 1999 | St. Louis River Historic Reconstruction Project | grid1800s.shp | Land_Use_Information\Lands_Cover_and_Use\Property_Ownership_and_Land_Use\Grid 1800s | Datum is NAD27 so is not aligned with the basemap. | YES |

**Table B-5. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available ? |
|---|---|---|---|---|---|---|---|---|---|
| **Land Cover/Use (cont.)** | Land Use 1950s | Industrial land use along the lower St. Louis River for the industrial time period. | Community GIS Services, Inc. | Kellner *et al.* 1999 | St. Louis River Historic Reconstruction Project | grid1950s.shp | Land_Use_Information\Lands_Cover_and_Use\Property_Ownership_and_Land_Use\Grid 1950s | Datum is NAD27 so is not aligned with the basemap. | YES |
| | Land Use 1980s | Industrial land use along the lower St. Louis River for the post-industrial time period. | Community GIS Services, Inc. | Kellner *et al.* 1999 | St. Louis River Historic Reconstruction Project | grid1980s.shp | Land_Use_Information\Lands_Cover_and_Use\Property_Ownership_and_Land_Use\Grid 1980s | Datum is NAD27 so is not aligned with the basemap. | YES |
| | Mines | Known mining operations, mineral deposits/occurrences and processing plants [derived from the Mineral Availability System (MAS)/Mineral Industry Location System (MILS)]. | USEPA/Office of Water/OST | USEPA 2003 | BASINS website | mines_utm.shp | Land_Use_Information\Lands_Cover_and_Use\Minerals_Mines | NA | YES |
| **NOAA C-CAP Data** | C-CAP Land Cover 1995 | Dataset consists of a 1995-era Landsat 7 Thematic Mapper scene which was analyzed according to the Coastal Change Analysis Program (C-CAP) protocol to determine land cover. | NOAA Coastal Services Center/Coastal Change Analysis Program (C-CAP) | NOAA 2003b | CD - NOAA C-CAP Data, MN DNR GAP Veg Data | ccaplu95.img | Land_Use_Information\ccap_nad83 | Users should note that files with ".metadata" extensions can be viewed using Wordpad. | YES |

**Table B-5. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available ? |
|---|---|---|---|---|---|---|---|---|---|
| **NOAA C-CAP Data (cont.)** | C-CAP Land Cover 2000 | Dataset consists of a 2000-era Landsat 7 Thematic Mapper scene which was analyzed according to the Coastal Change Analysis Program (C-CAP) protocol to determine land cover. | NOAA Coastal Services Center/Coastal Change Analysis Program (C-CAP) | NOAA 2003b | CD - NOAA C-CAP Data, MN DNR GAP Veg Data | ccaplu00.img | Land_Use_Information\ccap_nad83 | Metadata not available for this dataset, but it is reasonable to assume that the metadata file provided for the 1995 data set generally applies to the 2000 data set. | NO |
| | C-CAP Land Cover Change 1995-2000 | This data is a change analysis of 1995 C-CAP land cover and 2000 C-CAP land cover for the Great Lakes Region of the U.S. | NOAA Coastal Services Center/Coastal Change Analysis Program (C-CAP) | NOAA 2003b | CD - NOAA C-CAP Data, MN DNR GAP Veg Data | ccaplu95-00.img | Land_Use_Information\ccap_nad83 | Users should note that files with ".metadata" extensions can be viewed using Wordpad. | YES |
| **Tribal Interests** | Tribal Lands and Interests | Native Reservations MN. | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | tribal interests_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA | |
| **Roads/Rails** | State Forest Roads (MN) | Roads administered by the Commissioner of Natural Resources to provide access to lands administered by the Division of Forestry. | MN DNR - Division of Forestry | MDNR 2003a | Minnesota DNR GIS Data Deli | stfrdlnmn.shp | Land_Use_Information\Roads\State_Forest_Roads | NA | YES |

**Table B-5. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available ? |
|---|---|---|---|---|---|---|---|---|---|
| **Roads/Rails (cont.)** | Interstate Trunk Highways (MN) | Includes Interstate, US trunk highway, and Minnesota trunk highway system highway centerlines. | MN Department of Transportation, Survey and Mapping | MDNR 2003a | Minnesota DNR GIS Data Deli | interstatetrunkhwy .shp | Land_Use_Information\Roads\Interstate_Trunk_Highways | NA | YES |
| | County State Aid Roads (MN) | County state-aid highway (CSAH) is a category of highways based on funding designation. | MN Department of Transportation, Survey and Mapping | MDNR 2003a | Minnesota DNR GIS Data Deli | county_state_aid.shp | Land_Use_Information\Roads\County_State_Aid_Highways | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |
| | DOT Roads (MN) | This data set contains roadway centerlines for roads found on the USGS 1:24,000 mapping series. Those roadways that are Interstate, Trunk Highway, or CSAH (county state/aid Highway) are current through the 2000 construction season. | MN Department of Transportation, Survey and Mapping | MDNR 2003a | Minnesota DNR GIS Data Deli | dotroads.shp | Land_Use_Information\Roads\DOT_Roads | Users note that codes can be accessed on WWW through the metadata file (Section 5 - Data Table). | YES |

BASINS = Better Assessment Science Integrating Point and Nonpoint Sources; C-CAP = Coastal Change Analysis Program; CD = Compact Disc; CSAH = County State-Aid Highway; DLG = Digital Line Graph; DNR = Department of Natural Resources; DOT = Department of Transportation; GAP = Gap Analysis Project; GIS = Geographic Information System; HTML = HyperText Markup Language; MAS = Mineral Availability System; MESL = MacDonald Environmental Sciences Ltd.; MILS = Mineral Industry Location System; MIS = Management Information Services; MN = Minnesota; NA = Not Applicable; NAD27 = North American Datum of 1927; NOAA = National Oceanic and Atmospheric Administration; NRRI = Natural Resources Research Institute; NWI = National Wetlands Inventory; OST = Office of Science and Technology; UMN = University of Minnesota; US = United States; USEPA = United States Environmental Protection Agency; USGS = United States Geological Survey; Veg = Vegetation; WI = Wisconsin.

**Table B-6. Summary of GIS Data Compiled for the Recreation Project**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Recreation** | DNR ATV Trails | DNR managed ATV trails. | MN DNR | MDNR 2003b | MN DNR FTP site | trl_giaatvln3.shp | Recreation\DNR_ATV_trails | Users have no basis for interpreting attribute data because metadata does not define the information contained in the attribute fields (GIS data provides location data only). | YES |
| | DNR Snowmobile Trails | Location of snowmobile trails in Minnesota, regardless of funding source. | MN DNR | MDNR 2003b | MN DNR FTP site | trl_snomblln3.shp | Recreation\Snowmobile_Trails | NA | YES |
| | DNR State Trails | State trails DNR maintained by MN DNR Division of Trails and Waterways. | MN DNR | MDNR 2003b | MN DNR FTP site | trl_stateln3.shp | Recreation\DNR_State_Trails | NA | YES |
| | Jay Cooke State Park Trails | Location of state park trails. | MN DNR | MDNR 2003b | MN DNR FTP site | trl_stprkln4.shp | Recreation\Jay_Cooke_State_Park_Trails | Users have no basis for interpreting attribute data in several fields (e.g., trail_use, trail_src, surface) because metadata does not define the information contained in the attribute fields (GIS data provides location and names only). | YES |
| | Marinas | Location of local marina facilities for the purpose of response to potential oil spill situations. | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | marinas_utm_rev.shp | Water_Use_Information\Recreation\Marinas | Users should note that original WLS EPA Inland Sensitivity Atlas shapefile was updated to include 3 additional marinas (as per request of Judy Crane, MPCA). | YES |

**Table B-6. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Recreation (cont.)** | Recreational Areas of St. Louis River | Location of recreational areas around the St. Louis River Area of Concern. | Hedberg Map/visitduluth.com | Duluth Convention and Visitors Bureau 2003 | Shapefile created by MESL | rec areas.shp | Recreation\Recreational_Areas | NA | YES |
| | Water Access Sites | Location of water access sites around the St. Louis River Area of Concern. | MN DNR | MDNR 2003b | MN DNR FTP site | shor_waspt3.shp | Recreation\Water_Access_Sites | NA | YES |
| | Wisconsin Trails (all types) | Location of proposed and existing trails in Wisconsin. | WI DNR - Bureau of Parks and Recreation | WDNR 2003 | WI DNR FTP site | trails.shp | Recreation\WI Trails | NA | YES |

ATV = All Terrain Vehicle; DNR = Department of Natural Resources; GIS = Geographic Information System; MESL = MacDonald Environmental Sciences Ltd.; MN = Minnesota;
NA = Not Applicable; USEPA = United States Environmental Protection Agency; USGS = United States Geological Survey; Veg = Vegetation; WI = Wisconsin, WLS = Western Lake Superior.

**Table B-7. Summary of GIS Data Compiled for the USEPA Inland Sensitivity Atlas Project**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **USEPA Inland Sensitivity Atlas** | Dams | Locations of non-navigational dam sites (public water supply, power generation, flood control, irrigation and recreation). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | dams_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Fixed Oil Storage Facilities (# of oil tanks) | Fixed facilities store quantities of oil in above- or below- ground storage tanks with a storage capacity of 42,000 gallons or more. | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | fixed oil storage facilities_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Water Intakes | Local water intake facilities (for the purpose of effective response to potential oil spill situations). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | water_intakes_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Marinas | Location of local marina facilities (for the purpose of response to potential oil spill situations). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | marinas_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Boat Access | Local boat ramp access facilities (for quick and effective notification and response to potential oil spill situations). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | boat access_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |

**Table B-7. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **USEPA Inland Sensitivity Atlas (cont.)** | Shoreline Sensitivity | Sensitivity to coastal environments and wildlife to spilled oil (Lake Superior). | NOAA, Office of Ocean Resources Conservation and Assessment | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | shoreline sensitivity_utm .shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Special Designated Resource Areas | Areas of environmental significance not actively managed by any federal, state, regional or private agency. | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | special designated resource areas_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Sensitive Species[1] | Sensitive biological resources that are potentially at risk during a spill. | Inland Waterways Spill Response Mapping Project | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | sensitive species_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Environmentally Sensitive Resource Areas[1] | Special places meriting spill protection (areas not publicly managed, with no special designation). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | envirosenres_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Tribal Lands and Interests | Boundaries of land and water areas that are of specific tribal interest. | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | tribal interests_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |

**Table B-7. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **USEPA Inland Sensitivity Atlas (cont.)** | Managed Resource Areas[1] | Boundaries of federal, state, regional and private lands with special ecological, natural, or recreational value, which are uniquely vulnerable to oil spills (mapped for the Western Lake Superior Inland Sensitivity Atlas). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | managed resource areas_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Major Water Features | Major water features. | ESRI | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | major water features_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Rails | Railway system at the 1:100,000 scale. | Bureau of Transportation Statistics | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | rails_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Pipelines | Locations and routes of pipelines carrying crude oil or refined oil products. | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | pipelines_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |
| | Streams | Small to medium size streams extracted from the standard Geographic Data Technology line water layer and includes only Fcc codes H10 and H11. | ESRI | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | streams_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | YES |

**Table B-7. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **USEPA Inland Sensitivity Atlas (cont.)** | Roads | Interstate, U.S., and state highways and other major thoroughfares. | ESRI | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | roads_utm.shp | USEPA_Inland_Sensitivity_Atlas | Edited Bong Memorial Bridge to match quad map (was considerably off). | YES |
| | 1_25 000 Quad Index | The index to tiles data set depicts the extents to which data are mapped. | Inland Waterways Spill Response Mapping Project | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | 1_250000_index_utm.shp | USEPA_Inland_Sensitivity_Atlas | Users note that the image files (i.e., orthoquads) for which these indexes relate to are not included in the dataset. | YES |
| | 1_100 000 Quad Index | The index to tiles data set depicts the extents to which data are mapped. | Inland Waterways Spill Response Mapping Project | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | 1_100000_index_utm.shp | USEPA_Inland_Sensitivity_Atlas | Users note that the image files (i.e., orthoquads) for which these indexes relate to are not included in the dataset. | YES |
| | Great Lakes Boundary | Great Lakes Boundary. | -- | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | great lakes boundaries_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | NO |
| | County Boundaries | County Boundaries. | -- | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | county boundaries_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | NO |
| | State Boundaries | State Boundary. | -- | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | state_boundaries_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | NO |

ESRI = Environmental Systems Research Institute; GIS = Geographic Information System; NA = Not Applicable; NOAA = National Oceanic and Atmospheric Administration; USEPA = United States Environmental Protection Agency.

1 These shapefiles only contain natural heritage data from Minnesota DNR. Wisconsin DNR natural heritage information was not included at the request of the Wisconsin DNR.

**Table B-8. Summary of GIS Data Compiled for the Water Quality Project**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Clean Water Act Assessments** | 305b - Aquatic Life Use Assessments (MN) | Aquatic Life Use Support Assessments (Clean Water Act 305b). | -- | MPCA | GIS data sent by MPCA (Tad Schindler) | 305b_aql00.shp | Water_Quality\Clean_Water_Act_Assessments\Aquatic_Life_Use_Support_Assessments | Attribute table does not adequately describe meaning of data. Users would have to research State 305b program to interpret data. | NO |
| | 305b - Swimming Use Support Assessments (MN) | Swimming Use Support Assessments (Clean Water Act 305b). | -- | MPCA | GIS data sent by MPCA (Tad Schindler) | 305b_swim00.shp | Water_Quality\Clean_Water_Act_Assessments\Swimming_Use_Support_Assessments | Attribute table does not adequately describe meaning of data. Users would have to research State 305b program to interpret data. | NO |
| | TMDL - Impaired Waters (MN Lakes) | Impaired Waters - Lakes (Clean Water Act Section 303d). | -- | MPCA 2003 | TMDL and Minnesota's Waterways website | tmdl02_lakes.shp | Water_Quality\Clean_Water_Act_Assessments\Impaired_Waters | Attribute table does not adequately describe meaning of data. Users would have to research TMDL program to interpret data. | NO |
| | TMDL - Impaired Waters (MN Streams) | Impaired Water - Streams (Clean Water Act 303d). | -- | MPCA 2003 | TMDL and Minnesota's Waterways website | tmdl02_streams.shp | Water_Quality\Clean_Water_Act_Assessments\Impaired_Waters | Attribute table does not adequately describe meaning of data. Users would have to research TMDL program to interpret data. | NO |
| **Hydrology** | MN and WI Streams | Location of small to medium size streams (ESRI shapefile). | ESRI | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | Streams_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA | YES |

**Table B-8. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Hydrology (cont.)** | MN DNR Lakes | MN DNR 24,000K Lakes (medium scale lake polygons derived from the National Wetlands Inventory (NWI) polygons and MnDOT Basemap lake delineations, integrated with the DNR 24K Streams Layer). | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | dnrlkpymaj03.shp | Hydrology\Lakes\DNR_24K_Lakes | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |
| | USGS DLG Lakes and Wetlands (MN) | 1:100,000 scale hydrography (lakes only) derived from USGS Digital Line Graph's (DLG's) of the same scale. | USGS | MDNR 2003a | Minnesota DNR GIS Data Deli website | dlglkpystlo.shp | Hydrology\Lakes\DLG_Lakes_and_Wetlands_Polygons | Users note that codes can be accessed on WWW through the metadata file (Section 5 - HTML Table). | YES |
| **Miscellaneous Water Quality** | Bacteria Monitoring Stations | Location of selected water quality monitoring stations that monitor for 10 bacteria-related parameters. | USEPA Office of Water/OST | USEPA 2003 | BASINS website | bacstations.shp | Water_Quality\Bacteria Monitoring Stations | Users have no basis for interpreting codes reported in attribute table (metadata file does not define coding system). Theme has 12 additional dbf files (based on 4 year increments) of bacteria data, as well as a parameter table. Users will have to join these tables to the shapefile. | YES |
| | Drinking Water Supply | Location of water treatment plants. | -- | USEPA 2003 | BASINS website | drinkwatersupply.shp | Water_Quality\Drinking Water Supply | Meta data is not available for this dataset. Users have no basis for interpreting several fields in the attribute table (e.g., TMP_B, STCO, TYPE). | NO |

**Table B-8. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Miscellaneous Water Quality (cont.)** | Gage Sites | Inventory of surface water gaging station data including 7-Q-10 low and monthly stream flow. | USEPA Office of Water/OST | USEPA 2003 | BASINS website | gage.shp | Water_Quality\Gage Sites | NA | YES |
| | Milestone Monitoring Sites (MN) | Minnesota Milestone Monitoring Sites. | -- | MPCA | GIS data sent by MPCA (Tad Schindler) | milestone_sites.shp | Water_Quality\Minnesota Milestone Monitoring Sites | See associated files saved in the same sub-directory as the shapefiles for more information regarding this data set; no metadata. | NO |
| | Water Quality Monitoring | Location of water quality monitoring sites. | USEPA Office of Water/OST | USEPA 2003 | BASINS website | wqmonitoring.shp | Water_Quality\Water Quality Monitoring | Theme has 12 additional dbf files (based on 4 year increments) with statistical summaries of water quality stations, as well as a parameter table. Users will have to join these tables to the shapefile. | YES |
| | Water Quality Stations | USEPA's STORET Water Quality Observation Data. | USEPA Office of Water/OST | USEPA 2003 | BASINS website | waterqualitystations.shp | Water_Quality\Water Quality Stations and Observations | Theme has one additional dbf file containing raw data measurements for stations. User will have to join this table to the shapefile. | YES |
| | Water Intakes | Local water intake facilities (for the purpose of effective response to potential oil spill situations). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | water_intakes_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA | YES |

BASINS = Better Assessment Science Integrating Point and Nonpoint Sources; CD = Compact Disc; DLG = Digital Line Graph; DNR = Department of Natural Resources; GIS = Geographic Information System; MIS = Management Information Services; MN = Minnesota; MnDOT = Minnesota Department of Transportation; MPCA = Minnesota Pollution Control Agency; NA = Not Applicable; NWI = National Wetlands Inventory; OST = Office of Science and Technology; STORET = Storage and Retrieval; TMDL = Total Maximum Daily Load; USEPA = United States Environmental Protection Agency; USGS = United States Geological Survey; WI = Wisconsin, WWW = World Wide Web.

**Table B-9. Summary of GIS Data Compiled for the Water Use Project**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Dams** | Dams | Location of dams as well as age of the dam, number of people living downstream, and some inspection information. | USEPA Office of Water/OST | USEPA 2003 | BASINS website | dam_utm.shp | Water_Use_Information\Dams | Some coding is used in the attribute data table that is not defined in the metadata file. | YES |
| **Dredging** | Dredging Depths | Dredging Area Outline. | NOAA, National Ocean Service, Office of Coast Survey | NOAA 2003a | Electronic Navigational Charts Download website | Dredged_area_utm.shp | Water_Use_Information\Dredging | Users have no basis for interpreting attribute data in several fields because metadata does not define the information contained in the attribute fields. Metadata for this data is unreliable (see readme file). Assuming units are meters. | YES |
| **Harbor Facilities** | Harbor Facility Points | Harbor Facilites (Industrial) around St. Louis River. | NOAA, National Ocean Service, Office of Coast Survey | NOAA 2003a | Electronic Navigational Charts Download website | harbor_facilities_points_utm.shp | Water_Use_Information\Harbor_Facilities | Users have no basis for interpreting attribute data in several fields because metadata does not define the information contained in the attribute fields. Metadata for this data is unreliable (see readme file). | YES |
| **Hydrology** | MN and WI Streams | Location of small to medium size streams (ESRI shapefile). | ESRI | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | Streams_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA | YES |

**Table B-9. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Industry** | Industrial Water Use | Location of facilities with water appropriation permits. | MN DNR | MDNR 2003c | Water Use - Water Appropriations Permit Program website | swuds.shp | Water_Use_Information\Industry | NA | YES |
| **Navigation** | Navigable Waterway Nodes | Navigable Waterway Nodes (Navigation Points; nodes may represent physical entities such as river confluences, ports/facilities, and intermodal terminals, USACE nodes, or may be inserted for analytical purposes). | Vanderbilt Engineering Center for Transportation Operations and Research, Vanderbuilt University | USBTS 2003 | Bureau of Transportation Statistics Geographic Information Services website | waternd_utm.shp | Water_Use_Information\Navigation\Navigable Waterway Nodes | NA | YES |
| | Navigable Waterway Network | Navigable Waterway Network (Navigation Routes; a comprehensive network database of the nation's navigable waterways). | Vanderbilt Engineering Center for Transportation Operations and Research, Vanderbuilt University | USBTS 2003 | Bureau of Transportation Statistics Geographic Information Services website | nav_water-utm.shp | Water_Use_Information\Navigation\Navigable Waterway Network | NA | YES |
| **Public Use** | Fish Consumption Advisory Areas | Areas for which Fish Consumption Advisories are issued. | MN Department of Health | MDH 2003 | Environmental Health in MN website | fishadvis_update.shp | Water_Use_Information\Public_Use\Fishing_Advisories | NA | YES |

**Table B-9. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Public Use (cont.)** | Marinas | Location of local marina facilities (for the purpose of response to potential oil spill situations). | Great Lakes Commission | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | marinas_utm_rev.shp | Water_Use_Information\Public_Use\Marinas | Users should note that original WLS EPA Inland Sensitivity Atlas shapefile was updated to include 3 additional marinas (as per request of Judy Crane, MPCA). | YES |
| | Prohibited Areas | Prohibited Areas (Swimming Advisories). | St. Louis River Citizens Action Committee | SLRCAC 2001 | Shapefile created by MESL | prohibited_areas.shp | Water_Use_Information\Public_Use\Prohibited_Areas | NA | YES |

BASINS = Better Assessment Science Integrating Point and Nonpoint Sources; DNR = Department of Natural Resources; ESRI = Environmental Systems Research Institute; GIS = Geographic Information System; MN = Minnesota; MPCA = Minnesota Pollution Control Agency; NA = Not Applicable; OST = Office of Science and Technology; USACE = United States Army Corps of Engineers; USEPA = United States Environmental Protection Agency; WI = Wisconsin, WLS = Western Lake Superior.

**Table B-10. Summary of GIS Data Compiled for the Basemap Features for the Black and White Project**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| ***BASEMAP*** | | | | | | | | | |
| **Roads** | Main Roads | Interstate, U.S., and state highways and other major thoroughfares. | ESRI | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | roads_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA | YES |
| | Road Labels | Labels for major roads in AOC. | ESRI | NA | Shapefile created by MESL | road_Labels.shp | USEPA_Inland_Sensitivity_Atlas | NA | NO |
| **Rails** | Rails | Railroads. | Bureau of Transportation Statistics | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | rails_utm.shp | USEPA_Inland_Sensitivity_Atlas | Ownership is delineated with codes (code descriptions not provided in metadata; GIS data provides locations only). | YES |
| **Urban Areas** | Major Towns | Major towns of the St. Louis River AOC | MPCA (J. Crane) | NA | Shapefile created by MESL | towns.shp | Land_Use_Information\Urban_Areas | NA | NO |
| **Reach/Water Body Boundaries** | DB_AREA | Waterbody Boundaries for St. Louis River AOC | MPCA (J. Crane) | NA | Shapefile created by MESL | water_body_bounds_utm.shp | Hydrology\Reach_Water_Body_Boundaries | NA | NO |
| | Location Description | Reach Boundaries for St. Louis River AOC. | MPCA (J. Crane) | NA | Shapefile created by MESL | reach_bounds_utm.shp | Hydrology\Reach_Water_Body_Boundaries | NA | NO |
| **Water Boundaries (St. Louis River)** | St. Louis River | Boundary of St. Louis River (polygon). | -- | MPCA | GIS data sent by MPCA (Judy Crane) | Shp_pol_utm_update.shp | Hydrology\St._Louis_River_Boundaries\River_Polygon | NA | NO |

**Table B-10. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Stateline** | MN/WI State Line | State Line between MN and WI. | -- | NA | Shapefile created by MESL | stateline.shp | Land_Use_Information\Stateline | NA | NO |
| **Counties** | County Boundaries | Counties boundaries for MN and WI. | -- | MPCA | GIS data sent by MPCA (Judy Crane) | Counties_utm.shp | Land_Use_Information\Counties | NA | NO |
| | County Mask | extra county coverage for MN and WI. | -- | NA | Shapefile created by MESL | county_mask.shp | Land_Use_Information\Counties | NA | NO |
| | Great Lakes Boundary | Great Lakes Boundary. | -- | USEPA 2000 | Western Lake Superior USEPA Inland Sensitivity Atlas | great lakes boundaries_utm.shp | USEPA_Inland_Sensitivity_Atlas | NA (presenting data as it is distributed by USEPA) | NO |
| ***QUADS/ORTHOPHOTOS*** | | | | | | | | | |
| **Topographic Quad Maps** | Adolph.tif | quad -- Adolph. | USGS and MN DNR | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | Adolph.tif | Land Use Information\Quads and Orthophotos\Quads | NA | YES |
| | Duluth.tif | quad -- Duluth. | USGS and MN DNR | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | Duluth.tif | Land Use Information\Quads and Orthophotos\Quads | NA | YES |
| | Duluth_hghts.tif | quad -- Duluth Heights. | USGS and MN DNR | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | Duluth_hghts.tif | Land Use Information\Quads and Orthophotos\Quads | NA | YES |

**Table B-10. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Topographic Quad Maps (cont.)** | Esko.tif | quad -- Esko. | USGS and MN DNR | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | Esko.tif | Land Use Information\Quads and Orthophotos\Quads | NA | YES |
| | Lakewood.tif | quad - Lakewood. | USGS and MN DNR | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | Lakewood.tif | Land Use Information\Quads and Orthophotos\Quads | NA | YES |
| | Parkland.tif | quad -- Parkland. | USGS and MN DNR | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | Parkland.tif | Land Use Information\Quads and Orthophotos\Quads | NA | YES |
| | Superior.tif | quad -- Superior. | USGS and MN DNR | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | Superior.tif | Land Use Information\Quads and Orthophotos\Quads | NA | YES |
| | W_duluth.tif | quad -- West Duluth. | USGS and MN DNR | SLRCAC 2002 | CD - Lower St. Louis River Habitat Plan | W_duluth.tif | Land Use Information\Quads and Orthophotos\Quads | NA | YES |
| | Quad Index | Q024k directory - Quad Index. | USGS and MN DNR | MDNR 2003b | MN DNR FTP site | indx_q024kpy4.shp | Land Use Information\Quads and Orthophotos\Quads | NA | YES |
| **Orthophotos** | Doq03imq2139.tif | orthophoto -- Saginaw. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2139.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |
| | Doq03imq2140.tif | orthophoto --Adolph. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2140.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |

**Table B-10. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Orthophotos (cont.)** | Doq03imq2141.tif | orthophoto -- Duluth Heights. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2141.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |
| | Doq03imq2142.tif | orthophoto -- Duluth. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2142.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |
| | Doq03imq2143.tif | orthophoto -- Lakewood. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2143.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |
| | Doq03imq2239.tif | orthophoto -- Cloquet. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2239.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |
| | Doq03imq2240.tif | orthophoto -- Esko. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2240.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |
| | Doq03imq2241.tif | orthophoto -- West Duluth. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2241.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |
| | Doq03imq2242.tif | orthophoto -- Superior. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2242.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |
| | Doq03imq2339.tif | orthophoto -- Wrenshall. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2339.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |

**Table B-10. Continued**

| Data Category | Theme Name | Data Description | Data Originator | Acquired From | Acquisition Details | File Name | Location of GIS data C:\STLR_GIS Project\Shapefiles\..... | Notes | Metadata available? |
|---|---|---|---|---|---|---|---|---|---|
| **Orthophotos (cont.)** | Doq03imq2340.tif | orthophoto -- Frogner. | MN DNR - MIS Bureau | MDNR 2003a | Minnesota DNR GIS Data Deli website | doq03imq2340.tif | Land Use Information\Quads and Orthophotos\Orthophotos | NA | YES |

AOC = Area of Concern; BASINS = Better Assessment Science Integrating Point and Nonpoint Sources; CD = Compact Disc; DNR = Department of Natural Resources; FTP = File Transfer Protocol; GIS = Geographic Information System; MESL = MacDonald Environmental Sciences Ltd.; MIS = Management Information Services; MN = Minnesota; NA = Not Applicable; USEPA = United States Environmental Protection Agency; USGS = United States Geological Survey; WI = Wisconsin.

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# APPENDIX C

# SCREENING CRITERIA FOR EVALUATING CANDIDATE DATA SETS FOR THE PHASE I GIS-BASED SEDIMENT QUALITY DATABASE FOR THE ST. LOUIS RIVER AOC

# Appendix C. Screening Criteria for Evaluating Candidate Data Sets for the GIS-Based Sediment Quality Database for the St. Louis River Area of Concern (AOC)

MacDonald Environmental Sciences Ltd. (MESL) is working collaboratively with the Minnesota Pollution Control Agency (MPCA) and the National Oceanic and Atmospheric Administration (NOAA) to develop a GIS-based sediment quality database (GISSED) for the St. Louis River Area of Concern (AOC). When completed, the GISSED database will include sediment quality data collected since 1990 by various state, federal, tribal, and private groups. The database is being coupled with GIS information to generate visual techniques for presenting complex data in an understandable format for lay audiences, MPCA staff, and stakeholders. The database will be comprised of whole sediment data, sediment toxicity and bioaccumulation data, and tissue chemistry data. Although benthic invertebrate community data, pore water chemistry data, pore water toxicity data (except for Microtox® tests), and plant toxicity data (e.g., cattail and wild rice seed germination and growth) will not be included in this phase of the GISSED database, the availability of these types of data will be noted on the screening sheets. The following screening criteria are intended to provide a means of evaluating candidate data sets and assuring general consistency in the information included in the database. However, the screening criteria are not necessarily recommended for applications beyond their intended purpose.

## A. Criteria for Evaluating Data Set Acceptability

General

1. Samples must be located within the St. Louis River AOC. Sediment quality data collected from the St. Louis River and its tributaries upstream of the AOC, from nearby reference lakes, and from outside the harbor area in Lake Superior may be considered for incorporation in future updates of the GISSED database.

2. Data sets which include sediment quality data generated from dilution series of bulk sediments (i.e., elutriate tests) are not acceptable for incorporation into the database because there is too little connection between the chemistry and laboratory toxicity data. However, data from the 100% dilution series are acceptable to include in the GISSED database.

3. Data sets should include the location of sediment sampling sites, preferably by georeference coordinates (i.e., longitude and latitude). Otherwise, the georeference coordinates can be estimated using GIS software and maps of the sample site locations. Data sets for which sample locations cannot be georeferenced should be qualitatively described as to the waterbody and reach (e.g., Hog Island Inlet) within the St. Louis River AOC.

4. Acceptable procedures for collecting, handling and storing samples must be employed. If standard procedures (i.e., those developed by ASTM or USEPA) are not utilized, the alternative methods must be clearly stated and may be evaluated using best professional judgment. The rationale for decisions regarding procedure acceptability must be documented.

5. Any sediment horizon (i.e., surficial sediments, cored sediment sections, etc.) can be used to assess sediment toxicity, bioaccumulation, and/or chemical indicators..

Sediment/Tissue Chemistry

6. The sediment and/or tissue chemical analytical methods used in the study must be reported, must meet minimum data quality requirements/objectives, and detection limits must be reported. Data quality is considered acceptable if the author has stated that QA/QC procedures were followed and data quality objectives were met. If the author has not stated this clearly, data quality may be evaluated using various protocols and best professional judgment. The rationale for decisions regarding data acceptability must be documented.

7. Data acceptability for sediment and/or tissue chemistry data must be further assessed by screening laboratory qualifier codes after all data have been incorporated. Each result is categorized as detected, undetected, undetected (detection limit not specified), and unacceptable.

8. Sediment or tissue chemistry data that were generated using screening methods (e.g., X-ray fluorescence for metals; laser induced fluorescence (LIF) or other fluorometric screening methods for PAHs; immunoassay method for PCBs, etc.) are not acceptable for inclusion in the GISSED database.

9. Concentrations of SEM metals (e.g., Cd, Cu, Pb, Ni, and Zn) may be included in the database, although data on the concentrations of total metals (i.e., strong acid digestion) are preferred.

Toxicity/Bioaccumulation

10. Acceptable environmental conditions must be maintained throughout the toxicity/bioaccumulation tests (as defined in the protocols for the toxicity/bioaccumulation test). Consequently, the temperature, pH, alkalinity, hardness, conductivity, and DO of the overlying water should have been measured during the test. Acceptable conditions are considered to be achieved if the author states that standard methods were employed and that acceptable environmental conditions were maintained in the bioassay chambers. Alternatively, if the authors have not explicitly assessed the overlying water quality conditions, and the raw overlying water quality data is provided in the report, the data should be assessed for acceptable conditions. Subsequently, any toxicity/bioaccumulation results associated with environmental conditions outside the acceptable ranges should be

flagged.

11. The responses of the test organisms exposed to negative controls must be reported and be within acceptable limits (i.e., as defined in ASTM or USEPA test methods). For toxicity/bioaccumulation tests for which a negative control sediment is not available, then the selected field reference sediment must be shown to be functionally-equivalent to a negative control sediment, as indicated by non-toxicity (as defined by acceptable control sample criteria), concentrations of measured contaminants in matching sediment samples should not exceed their respective Level I SQTs, and the particle size distribution and TOC levels should be similar to that in the basin area under investigation.

12. Standard toxicity/bioaccumulation test laboratory procedures must be employed. If procedures other than those developed by ASTM or USEPA are utilized, the acceptability of the test procedure may be evaluated using best professional judgment. Preference will be given to novel test procedures that have been published in the peer-reviewed literature. The rationale for decisions regarding procedure acceptability must be documented.

13. Sediment samples must not be frozen prior to biological testing.

14. Sediment samples must be designated as toxic or non-toxic based on statistical comparisons with the negative control or a suitable reference site (see #11 for a definition of what constitutes a suitable reference site). Results from the negative control and/or reference samples must be included in the database. The USEPA's decision tree for statistical analysis of survival, growth, and reproduction data subjected to hypothesis testing should be used for evaluating sediment toxicity data (USEPA 2000). Significant difference ($p<0.05$) in toxicity/bioaccumulation test results from test samples compared to negative control or reference samples must be determined using a pair-wise 1-tailed statistical test.

15. Data sets generated using organic extracts may be included in the database (e.g., Microtox®), provided they are available with other toxicity data. Microtox® and Mutatox® data are not being targeted for inclusion in the database because the linkage between the toxicity data and effects on sediment-dwelling organisms is tenuous.

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# APPENDIX D

# DATA QUALITY CHECK SHEET FOR SEDIMENT QUALITY DATA FOR THE PHASE I GIS-BASED SEDIMENT QUALITY DATABASE FOR THE ST. LOUIS RIVER AOC

# Appendix D. Data Quality Check Sheet for SEDIMENT QUALITY DATA for the GIS-Based Sediment Quality Database for the St. Louis River Area of Concern

**STUDY NAME/STUDYID:** _____

**DATA ENTRY/TRANSLATION DATE:** _____

**QA/QC DATE:** _____

**MS EXCEL FILE NAME:** _____

**MS ACCESS FILE NAME:** _____

**STEP #2 QA/QC CHECKS FOR TRANSLATED DATA COMPLETED:**

Name of Reviewer #1 (print): _____ Initials/Date:_____

Name of Reviewer #2 (print): _____ Initials/Date:_____

**STEP #3 QA/QC CHECKS FOR MANUALLY-ENTERED DATA COMPLETED:**

Name of Reviewer #1 (print): _____ Initials/Date:_____

Name of Reviewer #2 (print): _____ Initials/Date:_____

***Initial and date to verify that changes incorporated:*** _____

***Initial and date to verify that QA checks were recorded in the master file (MASTER_QA_SUMMARY.xls):***_____

**Step #1: DOCUMENTATION**

The following information must be in MPCA's possession prior to entering data into the GIS-based database. Verify that the proper documentation is available.

MPCA Approved QAPP or SAP _____

Copy of the Laboratory Data Report Package _____
(either electronic or hard copy).

Post-Sampling QA/QC Audit Checklists _____

Name of Reviewer (print): _____ Initials/Date:_____

**Step #2: QA/QC PROCEDURES FOR VERIFYING TRANSLATED DATA**

The following steps are required as part of the QA/QC check of the data **translation** process, ***after*** data has been translated from spreadsheet format into MS Access format.

1. Use a random number generator to select x stations and y chemicals to check (determine x and y to ensure that at least 10% of the data are checked). **This ensures that all data for a chemical and/or station were not excluded in the translation process.**

2. One person reads the information from a printed copy of the original data file or hardcopy: site number, chemical name, analysis result, units, and qualifiers.

3. Another person verifies the information by putting a checkmark on a hardcopy.

4. If any errors are encountered, the reason for the error is investigated. Usually the error is associated with:
    1. A shift in the data (across or down or both). In this case the data are re-translated and datachecking would start from step 1, or
    2. An omission of a chemical or station or both. In this case the missing data are added and the datachecking process starts from step 1, *ensuring that the missing data are included as part of the datachecking step,* or
    3. Data fields have been truncated. In this case the data are re-translated and datachecking would start from step 1, or
    4. There are problems with the assigned data type (i.e., text vs. values; double number field vs. single number field). In this case the compatibility with the data types is resolved and tested, to ensure that the translated data represents exactly what was in the original data file. Then the data are re-translated and datachecking would start from step 1.

5. The hardcopy of the signed and dated datachecking sheets and the completed Data Quality Checksheet are retained on file for an indefinite time period.

6. An electronic list is maintained of the QA/QC checks conducted. Any errors and subsequent changes made are recorded in this list. This list is maintained in an MESL sub-directory that has an on-site and off-site back-up.

*Note: It is not necessary to outline procedures for incorporating changes (i.e., steps b to e in the procedures for verifying manually entered data), because there is a very low likelihood of generating the kinds of random errors that occur when manually entering data.*

## Step #3: QA/QC PROCEDURES FOR VERIFYING MANUALLY ENTERED DATA

The following steps are required as part of the QA/QC check of the **data entry** process, after data have been manually entered in spreadsheet or MS Access. Each cell that has manually entered data or information will be 100% verified.

1. One person reads the information from a printed copy of the original data file or hardcopy. This will include, at a minimum: site number, chemical name, analysis result, units, and qualifiers. Information entered in other fields that may be entered globally (e.g., DW or WW basis) do not have to be checked for each record.

2. Another person verifies the information by putting a checkmark on a hardcopy. Required corrections are recorded CLEARLY and NEATLY on the hardcopy

3. If any errors are encountered, the reason for the error is investigated. If the error is systemic, the data entry person corrects the errors and prints another hardcopy before datachecking resumes.

4. One person incorporates the corrections into the data file.

5. Another person checks that the corrections have been correctly incorporated, indicating this with a different colored checkmark on the hardcopy. This person also signs and dates the hardcopy (indicating changes have been incorporated).

6. The hardcopy of the signed and dated datachecking sheets and the completed Data Quality Checksheet are retained on file for an indefinite time period.

7. An electronic list is maintained of the QA/QC checks conducted. Any errors and subsequent changes made are recorded in this list. This list is maintained in an MESL sub-directory that has an on-site and off-site back-up.

8. All data sets should be double-checked to ensure that changes were incorporated and the Data Quality Checksheet should be signed and dated to confirm that this step was completed.