APPENDIX A.

Acronyms, Abbreviations, and Glossary
of Terms Used in the Document

Appendix A. Acronyms and Abbreviations

AOC - Area of Concern
ARBC - American Revolution Bicentennial Commission
BAT - best available technology
BC - *Bythrotrephes cederstroemi*
BCFs - bio-concentration factors
BOD - biochemical oxygen demand
bw - body weight
CAC - Citizens Advisory Committee
cm - centimeters
COE - (U.S. Army) Corps of Engineers
CSO - combined sewer overflow
DHSS - (Wisconsin) Department of Health and Social Services
EPA - (U.S.) Environmental Protection Agency
FERC - Federal Energy Regulatory Commission
FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act
FDA - (U.S.) Food and Drug Administration
ft - feet
FWPCA - Federal Water Pollution Control Act
g - gram
GLFC - Great Lakes Fisheries Commission
Hg - Mercury
hr - hour
IARC - International Agency for Research on Cancer
IJC - International Joint Commission
kg - kilogram
l - liter
lbs - pounds
LC_{50} - lethal concentration 50%
LSPI - Lake Superior Paper Industries
MBH - Minnesota Board of Health
MDH - Minnesota Department of Health
MDNR - Minnesota Department of Natural Resources
MDOT - Minnesota Department of Transportation
mg - milligram
mgd - million gallons per day
mi - mile
MIC - Metropolitan Interstate Committee
mm - millimeter
MN - Minnesota
MOE - (Canadian) Ministry of the Environment
mpn - most probable number
MPCA - Minnesota Pollution Control Agency
MSBH - Minnesota State Board of Health
ng - nanogram

NPDES - National Pollutant Discharge Elimination System
NPL - National Priorities List
NW - northwest
PAHs - polynuclear aromatic hydrocarbons
PCBs - polychlorinated biphenyls
PCP - pentachlorophenol
pg - picogram
POTW - publicly owned treatment works
ppm - parts per million
RALs - recommended allowable levels/limits
RAP - Remedial Action Plan
RCRA - Resource Conservation and Recovery Act
ROD - Record of Decision
SAIC - Science Applications International Corporation
SQG - Sediment Quality Guidelines
TAC - Technical Advisory Committee
TCDD - 2,3,7,8 tetrachlorodibenzo-p-dioxin
TWCL - tissue water concentration level
ug - microgram
um - micrometer
USDA - U.S. Department of Agriculture
USFWS - U.S. Fish and Wildlife Service
USGS - U.S. Geological Survey
UWS - University of Wisconsin-Superior
VOCs - volatile organic chemicals
WDNR - Wisconsin Department of Natural Resources
WI - Wisconsin
WLSSD - Western Lake Superior Sanitary District
WPCF - Water Pollution Control Federation
yr - year

Appendix A. Glossary of Terms

Area of Concern:	A geographic area which fails to meet the objectives of (AOC) the Water Quality Agreement and where such failure has caused or is likely to cause impairment of beneficial use or of the area's ability to support aquatic life (IJC 1989).
Ambient:	Refers to the environmental conditions that affect a body or system, but that are not affected by it (Freedman 1989).
Anthropogenic:	Occurring because of, or influenced by, the activities of people (Freedman 1989).
Aroclors:	A trade name for a family of chlorinated organic chemicals.
Bioaccumulation:	A general term describing a process by which chemicals are taken up by aquatic organisms from water directly or through consumption of food containing the chemicals (Rand and Petrocelli 1985).
Biochemical oxygen demand: (BOD)	The amount of dissolved oxygen required for the bacterial decomposition of waste in water. The determination is made with an empirical test which measures biochemical degradation, oxidation of inorganic sulfides, ferrous ions, and nitrogen (APHA 1981).
Bioconcentration:	A process by which there is a net accumulation of a chemical directly from water into aquatic organisms resulting from simultaneous uptake and elimination (Rand and Petrocelli 1985).
Biodegradation:	The process by which biological metabolism, usually microbial, transforms certain toxic chemicals or sewage into other chemicals, either innocuous or toxic (Freedman 1989).
Biomagnification:	A result of the processes of bioconcentration and bioaccumulation by which tissue concentrations increase as the chemical passes up two or more trophic levels (Rand and Petrocelli 1985).
Biomonitoring:	Use of living organisms as "sensors" in water quality surveillance to detect changes in an effluent or water, and to indicate whether aquatic life may be endangered (Rand and Petrocelli 1985).
Concentration:	The quantifiable amount of chemical in the surrounding water, food or sediment (Rand and Petrocelli 1985).
Congener:	A chemical of the same family having a different chemical structure.

Conservation:	The protection, preservation and careful management of a natural resource (Freedman 1989).
Contaminant:	A substance that causes a deviation from the normal composition of the environment. Contaminants are not classified as pollutants unless they have some detrimental effect (Manahan 1984).
Conventional pollutant:	Pollutants which have been measured as indicators of water quality, e.g. fecal coliform, pH, biological oxygen demand (BOD) and suspended solids (Findley and Farber 1988).
Criteria:	An estimate of the concentration of a chemical or other (water quality):constituent in water which if not exceeded, will protect an organism, an organism community, or a prescribed use or quality with an adequate degree of safety (Rand and Petrocelli 1985).
Critical pollutant:	Substances which persist at levels that, singly or in synergistic or additive combination, are causing, or are likely to cause, impairment of beneficial uses despite past application of regulatory controls. These substances are present in open water, and are either a recognized threat to human health or aquatic life, or bioaccumulate (IJC 1987). The International Joint Commission has identified eleven toxic chemicals in this category. These chemicals include dioxins and furans, benzo(a)pyrene, DDT, dieldrin, HCB, alkylated lead, mirex, mercury, PCBs and toxaphene.
CSO (combined) sewer overflow):	Overflow of untreated water from a treatment plant/outfall during heavy storm events due to the fact that the sanitary sewers and storm sewers are connected.
Ecosystem:	A system of interacting components, physical and biological (including humans), having some degree of internal linkage and some implied boundary (NRC 1985).
Ecosystem approach:	The philosophy embodied by the 1978 Water Quality Agreement which incorporates the "interacting components ... within the drainage basin of the St. Lawrence River ... to restore and maintain the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem." (NRC 1985).
Enrichment:	Enhancement of the rate of supply of nutrients to a system causing an increase in productivity (Freedman 1989).
Environment:	The complex of all biotic and abiotic influences on an organism or group of organisms (Freedman 1989).

Eutrophic:	A descriptor of a water body that has high nutrient levels.
Eutrophication:	The process of stimulation of biological production by increase of plant nutrient input either naturally or from agricultural, municipal, or industrial sources (NRC 1985).
Graywacke:	A conglomerate rock consisting of rounded pebbles and sand firmly unified.
Groundwater:	Water occurring below the soil surface and that is held in the soil itself or in an aquifer (Freedman 1989).
Half-life:	Time required to reduce by one-half the concentration of a chemical in a medium (e.g., soil or water) or organism (e.g., fish tissue) by transport, degradation, transformation, or depuration (Rand and Petrocelli 1985).
Harmful quantity:	Any quantity of a substance that if discharged into a receiving water would be inconsistent with the achievement of Water Quality Objectives (IJC 1989).
Hazard:	Likelihood that a chemical will cause an injury or adverse effect under the conditions of its production, use, or disposal (Rand and Petrocelli 1985).
In-place pollutant:	Sediment associated contaminants which have the potential to contaminate or act as a pollutant source to overlying water (NRC 1985).
Leaching:	The process by which dissolved substances are removed by a percolating water solution (Freedman 1989).
Management:	The care and tending of a natural resource (Freedman 1989).
Mesotrophic:	A descriptor for a water body that has intermediate nutrient levels.
Monitoring:	A process which utilizes a scientifically designed system of continuing standardized measurements and observations and includes the evaluation thereof (IJC 1989). Surveillance undertaken to ensure that previously formulated standards are being met (Cairns 1988).
Natural:	A situation that is not measurably influenced by humans (Freedman 1989).
Non-conventional pollutant:	Chemicals which are neither toxic nor conventional pollutants as classified by the EPA and the Clean Water Act (Findley and Farber 1988).

Appendix A cont. Glossary of Terms

Non-governmental organization:	A public sector organization without direct links to the government (Freedman 1989).
Non-point source:	A land management or land use activity that contributes or may contribute to ground and surface water pollution as a result of runoff, seepage, percolation, or deposition.
Nutrient:	Chemicals that are required for life, e.g., nitrogen, phosphorus, iron, carbon or oxygen (Freedman 1989).
Oligotrophic:	A descriptor for a water body that has low nutrient levels.
Persistence:	The amount of time a chemical remains in the environment in its present form. The IJC (1989) defines persistent chemicals as having a half-life in water of greater than eight weeks.
Persistent toxic substance:	Toxic substances which are resistant to physical, chemical or biological modification or breakdown into less toxic substances (Muldoon and Valiante 1988).
Pesticide:	A substance used to kill unwanted fungi, plants, insects, or animals. This generic term is used to describe fungicides, algicides, herbicides, insecticides, or rodenticides (Rand and Petrocelli 1989).
Point source:	A single point of emission such as a smoke stack or sewage outfall pipe (Freedman 1989).
Pollutant:	A substance present in greater than natural concentration as a result of human activity and having a net detrimental effect upon its environment or upon something of value in that environment (Manahan 1984).
Remedial Action Plan (RAP):	Under the direction of the IJC, a plan which is developed for an Area of Concern. The plan describes the environmental problem, defines impaired uses, evaluates in place and alternative remedial measures, identifies responsible agencies for implementation, evaluates implementation, describes surveillance and monitoring and confirms restoration of uses.
Research:	Includes the development, interpretation, and demonstration of advanced scientific knowledge for the resolution of issues. It does not include monitoring or surveillance of water or air quality (IJC 1989).
Residence time:	The length of time that a quantity of substance remains in an environmental compartment (Freedman 1989).
Residue:	The quantity of a pollutant that remains in a particular environmental compartment (Freedman 1989).

Risk:	A statistical concept defined as the expected frequency of probability of undesirable effects resulting from a specified exposure to known or potential environmental concentrations of a material. Estimates of risk may be expressed in absolute or relative terms. Absolute risk is the excess risk due to exposure. Relative risk is the ratio of risk in the exposed population to the risk in the unexposed population. (Rand and Petrocelli 1985).
Seiche:	A movement back and forth of the water in a lake or other land-locked body of water, varying in duration and resulting in fluctuation of the water level.
Significant:	Refers to the statistical probability that the conclusion which has been reached is correct (e.g., 95% probability or $p < 0.05$ are common expressions of significance) (Freedman 1989).
Standard: (water quality)	The limiting concentration of a chemical which is permitted in an effluent or waterway. Standards are established for regulatory purposes and are determined from a judgement of the criteria involved. The standard is dependent on the use (e.g. potable, agricultural) of the water to be protected. (Rand and Petrocelli 1985).
Stress:	Physical, chemical or biological constraints that limit the potential productivity of the biota (Freedman 1989).
Surface water:	Fresh water occurring free at the surface as in lakes, ponds, rivers, streams (Freedman 1989).
Surveillance:	Includes specific observations and measurements relative to control or management (IJC 1989). A continued program of surveys systematically undertaken to provide a series of observations in time (Cairns 1988).
Survey:	An exercise in which a set of standardized observations is taken from a station(s) within a short period of time to furnish qualitative or quantitative descriptive data (Cairns 1988).
Tolerance:	Refers to the genetically based resistance of an environmental stress or combination of stresses (Freedman 1989).
Toxicity:	The inherent potential or capacity of a material to cause adverse effects in a living organism (Rand and Petrocelli 1985).
Toxic pollutant:	One of 129 specific chemicals listed in the Clean Water Act for which specific treatment, e.g. best available technology, zero discharge; is employed to protect public health with an ample margin of safety or to attain ambient water quality standards (Colborn et al. 1990).

Toxicant:	An agent or material capable of producing an adverse response (effect) in a biological system, seriously injuring structure or function or producing death (Rand and Petrocelli 1985).
Undetectable concentration:	Refers to the concentration of a substance that is smaller than the detection limit of the available analytical technology and does not imply a concentration of zero (Freedman, 1989).
Virtual elimination:	The policy embodied by the International Joint Commission which advocates the elimination of all known sources of toxics excepting the possibility of spills and natural occurrences. Virtual elimination is the actualization of the "zero discharge" philosophy (Colborn et al. 1990).
Water quality:	The condition of ambient water as measured by fecal pollution causing bacterial and viral disease and toxic contamination where pollutants include: industrial chemicals such as chlorinated hydrocarbons, heavy metals (cadmium, lead, mercury); municipal and industrial wastes in general (Manahan 1984).
Wisconsin Endangered Species:	Any species whose continued existence as a viable component of this state's wild animal or wild plant is determined by the Department of Natural Resources to be in jeopardy on the basis of scientific evidence (Department of Natural Resources 1989).
Wisconsin Threatened Species:	Any species which appears likely, within the foreseeable future, on the basis of scientific evidence to become endangered (Department of Natural Resources 1989).
Xenobiotic:	A chemical or material not produced in nature and not normally considered a constitutive component of a specified biological system. This term is usually applied to manufactured chemicals (Rand and Petrocelli 1985).
Zero discharge:	A philosophy introduced by the International Joint Commission towards achieving the standards for persistent toxic chemicals in the environment. A ban on the production of a chemical, e.g. DDT, reflects one facet of such a philosophy. Control of secondary emissions, e.g. release of sediment stored toxic chemicals, needs also to be addressed in this philosophy (Colborn et al. 1990).

APPENDIX B

Fish Tissue Data

APPENDIX B

ST. LOUIS RIVER SYSTEM AOC FISH TISSUE DATA
MINNESOTA POLLUTION CONTROL AGNECY

Latitude/Longtitude Location	Anatomy	Sample Size	Weight	Year	Species	MG/KG PCBS	UG/G DDT	MG/KG PCP	MG/KG ARSENIC	MG/KG MERCURY	MG/KG LEAD	PG/G TCCD
46 50 58 92 46 13 USH 2 Near Brookston	Whole Organism	2	1.0	1978	Channel Catfish	0.127	0.016	*	0.010	0.140	0.059	*
		3	1.2	1978	Northern Pike	*	*	*	0.010	0.190	0.050	*
		1	1.5	1978	White Sucker	0.035	0.149	0.018	0.020	0.120	0.050	*
		5	1.8	1978	Shorthead Redhorse	0.121	0.013	0.018	0.030	0.180	0.50	*
		4	1.1	1978	Shorthead Redhorse	0.077	0.017	0.037	0.020	0.150	0.050	*
	Plug with Skin	3	1.2	1978	Northern Pike	*	0.010	*	0.030	0.280	0.020	*
		5	1.8	1978	Shorthead Redhorse	*	0.010	*	*	0.290	0.050	*
	Whole Organism	5	1.2	1979	Walleye	*	*	*	*	0.390	0.040	*
		5	1.3	1979	White Sucker	*	*	*	*	0.160	0.90	*
		5	0.7	1979	White Sucker	*	*	*	*	0.150	0.060	*
	Fillet with Skin	1	10.5	1986	Northern Pike	*	*	*	*	*	*	*

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Latitude/Longtitude Location	Anatomy	Sample Size	Weight	Year	Species	MG/KG PCBS	UG/G DDT	MG/KG PCP	MG/KG ARSENIC	MG/KG MERCURY	MG/KG LEAD	PG/G TCCD
46 45 5 92 6 0 St. Louis Bay	Whole Organism	5	1.1	1978	Northern Pike	0.151	0.006	0.090	0.010	0.170	0.060	*
		7	1.9	1978	White Sucker	0.319	0.018	*	0.010	0.180	0.110	*
		1	1.7	1978	Shorthead Redhorse	0.789	0.032	*	0.020	0.190	0.100	*
		5	0.7	1979	Walleye	*	*	*	0.020	0.250	0.080	*
		5	2.1	1979	White Sucker	*	*	*	0.020	0.120	0.390	*
		5	1.9	1979	White Sucker	*	*	*	0.010	0.100	0.050	*
	Plug with Skin	5	1.1	1978	Northern Pike	*	*	0.144	0.010	0.250	0.060	*
		7	1.9	1978	White Sucker	0.131	*	0.131	0.010	0.250	0.070	*
	Fillet with Skin	4	1.8	1980	Northern Pike	0.122	*	*	*	0.270	*	*
		4	3.9	1980	Northern Pike	0.064	*	*	*	0.590	*	*
		3	5.8	1980	Northern Pike	0.142	*	*	*	0.450	*	*
		2	1.5	1980	Walleye	0.369	*	*	*	0.710	*	*
		3	2.2	1980	Walleye	0.057	*	*	*	1.000	*	*

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Latitude/Longtitude Location	Anatomy	Sample Size	Weight	Year	Species	MG/KG PCBS	UG/G DDT	MG/KG PCP	MG/KG ARSENIC	MG/KG MERCURY	MG/KG LEAD	PG/G TCCD
		3	1.8	1980	White sucker	0.529	*	*	*	0.340	*	*
46 45 5 92 6 0 St. Louis Bay cont.	Fillet with Skin	2	2.3	1980	White Sucker	1.030	*	*	*	0.230	*	*
46 45 5 92 6 0 Duluth/Superior	Fillet with Skin	4	5.5	1982	Northern Pike	2.200	*	*	*	0.450	*	*
		3	3.5	1982	Walleye	3.600	*	*	*	0.780	*	*
		5	3.5	1982	White Sucker	0.090	*	*	*	0.290	*	*
46 43 57 92 9 9 St. Louis Bay 0.05 Mi East of Duluth	Whole Organism	5	1.6	1982	White Sucker	0.028	*	*	*	*	*	*
	Fillet with Skin	5	1.6	1982	White Sucker	0.280	*	*	*	0.250	*	*
45 45 17 92 10 25 St. Louis Bay 0.05 Mi S of Duluth	Whole Organism	2	2.2	1982	Northern Pike	*	*	*	*	*	*	*
		5	1.9	1982	White Sucker	*	*	*	*	*	*	*
	Fillet with Skin	2	2.2	1982	Northern Pike	0.100	*	*	*	0.250		
	Fillet with Skin	5	1.9	1982	White Sucker	0.370	*	*	*	0.230	*	*

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ST. LOUIS RIVER SYSTEM AOC FISH TISSUE DATA
MINNESOTA POLLUTION CONTROL AGNECY

Latitude/Longtitude Location	Anatomy	Sample Size	Weight	Year	Species	MG/KG PCBS	UG/G DDT	MG/KG PCP	MG/KG ARSENIC	MG/KG MERCURY	MG/KG LEAD	PG/G TCCD
46 41 33 92 17 56 St. Louis Bay 2 Mi NE of Gary	Whole Organism	2	2.2	1982	Northern Pike	*	*	*	*	*	*	*
		5	1.7	1982	White Sucker	*	*	*	*	*	*	*
	Fillet with Skin	2	2.2	1982	Northern Pike	0.060	*	*	*	0.330	*	*
		5	1.7	1982	White Sucker	0.230	*	*	*	0.220	*	*
		3	6	1986	Carp	0.230	*	*	*	*	*	8.200
		5	2.6	1986	Northern Pike	*	*	*	*	*	*	0.500
		5	2	1986	Walleye	*	*	*	*	*	*	0.500
46 42 37 92 25 8 St. Louis Bay 0.5 Mi E of Scanlon Dam	Fillet with Skin	2	4.4	1983	Carp	*	*	*	*	*	*	*
		3	8.4	1983	Carp	1.5	*	*	*	*	*	*
46 43 33 92 26 59 St. Louis Bay At Knife Falls	Fillet with Skin	1	10.5	1986	Northern Pike	*	*	*	*	*	*	*
		3	0.9	1986	Walleye	*	*	*	*	*	*	*
46 44 34 92 29 0 St. Louis Bay At Cloquet	Fillet with Skin	4	1.6	1988	White Sucker	*	*	*	*	0.230	*	*

SS = Spottail shiner
ES = Emerald shiner
WP = White perch
YP = Yellow perch
BC = Black crappie
LP = Logperch
BG = Bluegill
RF = Ruffe
AW = Alewife
RS = Rainbow smelt
JD = Johnny darter
CS = Common shiner
WS = White sucker
TP = Trout perch
LB = Largemouth bass
FM = Fathead minnow
SHR = Shorthead redhorse
SR = Silver redhorse
RB = Rock bass

APPENDIX F

Toxics Technical Advisory Committee Sediment Subcommittee Report

Appendix F

St. Louis River Remedial Action Program
Toxics Technical Advisory Committee
Sediment Subcommittee Report
28 February, 1990

(Mary Schubauer-Berigan, Larry Brooke, Daniel Call)

This report describes the findings and recommendations of the subcommittee to determine appropriate criteria for classifying sediments. We first examined IJC's guidelines for assessing sediment contamination; the IJC recommendations are summarized. Several U.S. EPA Environmental Research Laboratories are currently developing methods to examine sediment contamination; techniques which may be useful to apply to the St. Louis River/Bay area of concern are described below.

The IJC (1988) recommends use of a "sediment quality triad" approach (Chapman 1986) in determining degree of sediment contamination. This approach combines bulk sediment contaminant concentrations, *in situ* benthic diversity, and toxicity tests to give a composite picture of overall sediment "health". The IJC Assessment subcommittee recommends performing assessment in two stages (Figure 1).

The first stage consists of an initial assessment in the area to determine whether there is cause for concern about sediment contamination. This stage consists of measuring bulk chemical concentrations of the contaminants of interest, measuring concentrations of residues in fish tissues, and/or evaluating whether there is a general loss of benthic community structure. If these assessments reveal a contamination problem, the second stage assessments are then initiated. This begins with an extensive physical mapping of the region of concern to identify areas of sediment which are homogenous in their physical composition and likely to be similarly polluted. This step reduces the number of sites to be assessed in the next phases. Phase 2 of Stage II involves measuring surficial sediment chemistries, including metal and organic contaminant concentrations, and surveying benthic communities to establish areas which have been adversely impacted. Areas which have low community diversity and high chemical concentrations (both relative to "background" levels) are then subjected to extensive toxicity tests to determine the sorts of effects that these contaminants have upon a variety of organisms in the laboratory. All stages of these procedures require parallel assessment of a "control" sediment, which is a nearby, unimpacted sediment whose physical characteristics (e.g., particle size, water content, dissolved organic carbon concentrations) closely resemble the sediment of concern. Values obtained for the control sediment are then compared with those obtained for the contaminated sediment to determine the extent of the problem.

With respect to meeting the IJC assessment guidelines, Stage 1 has been essentially completed on the St. Louis River/Bay site. Fish advisories and existing chemical concentration data indicate the existence of toxic sediments. Data on the Bay/River sediments are currently being summarized and mapped by Arrowhead Regional Development Corporation (ARDC). Conversations with representatives of ARDC indicated that they are expecting to release a report and/or maps of the sediment concentration data in two months, funding permitting. However, from the studies we have seen thus far, there appears to be very little data applicable to the Stage II IJC subcommittee recommendations. One problem is that much of the existing research on the harbor focuses on the ship channel sediments and was instigated to determine the effects of dredge disposal. There is very little information on backwater areas in the bay or river, which probably contain the most important

sediments impacting the benthic biota and the organisms which feed on them. Also, most of the data which does exist for the harbor area is restricted to bulk sediment concentration data, which gives very little information on the biotic effects of these sediments; there appear to be only limited data on bioassays or benthic surveys in the St. Louis Bay/River area. We feel this committee should strongly recommend further study of sediments in the area of concern before expensive and time-consuming remediation is proposed. Implementing these studies will necessitate the identification of an appropriate control site for the region. Such a site should be selected carefully, as findings in the St. Louis River/Bay will be contrasted to this site to determine degree of contamination at each site.

In addition to the IJC assessment recommendations, there are a variety of other types of sediment quality criteria currently (SQC) in development. The citizens advisory committee may want to investigate the addition of these to IJC recommendations. Freshwater sediment quality criteria are currently being developed at several U.S. EPA Environmental Research Laboratories, including the Duluth lab. Non-chemical specific criteria use benthic species representing several taxonomic levels in toxicity tests with both whole sediments and various aqueous fractions (i.e., interstitial water and elutriates). These types of tests, as mentioned above, are also recommended for use by IJC. The chemical-specific SQC being developed are quite different from the dredge disposal guidelines traditionally used by EPA regions, the U.S. Army Corps of Engineers, and state agencies (Table 1) because they acknowledge that total sediment concentrations of chemicals of concern often relate little information on bioavailability of these contaminants, and that parameters in sediments such as grain size, organic carbon content, and hardness, for example, can control the fate of many contaminants. Basically, the goal of developing chemical-specific SQC is to determine concentrations of contaminants in sediments which will cause some detrimental effect upon the biota of the system (e.g., acute toxicity, chronic toxicity, bioaccumulation, tumor formation).

There are currently SQC being developed for nonpolar organic compounds. Researchers have found that the primary route of exposure to benthic organisms for some nonpolar organics (e.g., pesticides, PCBs, chlorinated benzenes) and metals is through the sediment interstitial (pore) water (Adams et al. 1985, Knezovich and Harrison 1988, Swartz et al. 1985). The equilibrium partitioning theory (DiToro 1989) allows prediction of pore water concentrations of organic compounds based on bulk sediment concentrations and the amount of organic carbon in the sediment. The pore water values can then be compared to water quality criteria for the chemical measured to determine the effect on biota. Although this approach does not work for all non-polar organic compounds, especially for those whose primary route of exposure is through ingested particles, it does work for some. This approach has the advantage of being relatively simple to apply: all that is needed is the sediment contaminant concentration and the amount of sediment organic carbon. However, this subcommittee is unaware whether organic carbon concentrations have been measured in sediment studies to date. There may be a federal guidance document on the equilibrium partitioning method as early as the fall of 1990.

The problem of metal contamination is also being addressed by the U.S. EPA. Recent evidence from studies with cadmium have indicated that bioavailability, and hence, toxicity of some metals is closely associated with the concentration of sulfide in the sediments (DiToro et al. 1989). Metals are bound to acid-volatile sulfide (AVS) in a molar ratio by *in situ* sediment processes. It has been found that once the AVS is completely bound by metals, additional metals are then bioavailable and cause toxicity. Use of this method to establish metal effects on biota is in the early stages of development and needs further field evaluation before it is established as a SQC determinant.

Another type of chemical-specific SQC developed at the Duluth EPA lab is toxicity identification evaluation (TIE). These procedures were designed to identify contaminants in complex effluent mixtures by associating toxicity with specific compounds (Mount and Anderson-Carnahan 1989a,b, and Mount 1989). These procedures have been successfully applied to sediments in other IJC areas of concern (Ankley et al. 1990). There are several problems with applying these procedures: they are relatively expensive when applied to large numbers of areas, and they are currently only applicable to sediments which show acute toxicity. However, despite these obstacles, the procedures are proving valuable in pinpointing exactly which chemicals are causing toxicity in a sediment, which can be extremely useful both in deciding appropriate remedial action and in identifying present or historical point sources of the contaminants. A guidance document describing the use of these procedures with sediments should be released soon.

Given the current state of information and research on the St. Louis River/Bay, it is impossible to apply any criteria other than the dredge disposal guidelines. With that in mind, we investigated criteria currently in use by the MPCA, WDNR, and Ontario Ministry of Environment (MOE). The most conservative criteria were selected for each parameter to determine degree of contamination, and are shown in Table 1.

The subcommittee compared three sets of criteria which are currently in use for characterizing the degree of sediment contamination:

1. Guidelines for pollutional classification of Great Lakes harbor sediment (U.S. EPA Region V 1977). (See Table 2)

2. Ontario Ministry of Environment bulk chemical guidelines for determining whether dredged material requires confined disposal.

3. Wisconsin interim guidelines for open water disposal of dredged material in Lake Superior. (See Table 3)

All of these guidelines are based upon bulk chemistry of the sediments only. The most conservative guidelines are given for each parameter in Table 1. These guidelines represent the most sensitive value from either the Ontario Ministry of Environment, the Wisconsin interim guidelines, or the 1977 EPA guidelines for the "moderately polluted" classification. IJC recommends that this type of criteria be exclusively used only for the initial assessment of sediment contamination, and not as the sole criterion upon which remediation is based. Upon reviewing the IJC recommended assessment procedures, the sediment subcommittee of the Toxics TAC recommends the following:

Immediate financial and technical support to complete current data summarization and graphical presentation of existing data.

Implementation of the IJC-recommended assessment strategies (i.e., toxicity tests, benthic surveys, and bulk chemical analyses) in the backwater and embayment areas likely to support most of the aquatic biota in the St. Louis River/Bay.

Investigation of other criteria (e.g., U.S. EPA) which may be applicable to the St. Louis River/Bay assessment.

Figure 1. **Assessment strategy recommended by the IJC Sediment Subcommittee for sediments in Great Lakes areas of concern (from IJC 1988).**

Table 1. Guidelines from the Ontario Ministry of Environment and Wisconsin DNR and EPA Region 5.

	Concentrations in mg/kg, dry weight	
Organics	Non-polluted	Polluted
PCB, total	< 0.05	≥ 0.05
Total 2,3,7,8-TCDD	< 1.0 pg/g	≥ 1.0 pg/g
Total 2,3,7,8-TCDD	< 10.0 pg/g	≥ 10.0 pg/g
Aldrin	< 0.01	≥ 0.01
Dieldrin	< 0.01	≥ 0.01
Chlordane	< 0.01	≥ 0.01
Endrin	< 0.05	≥ 0.05
Heptachlor	< 0.05	≥ 0.05
Lindane	< 0.05	≥ 0.05
Toxaphene	< 0.05	≥ 0.05
DDT	< 0.01	≥ 0.01
DDE	< 0.01	≥ 0.01
Benzo(a)pyrene	< 1.0	≥ 1.0
Metals		
Arsenic	< 3.0	≥ 3.0
Barium	< 20.0	≥ 20.0
Cadmium	< 1.0	≥ 1.0
Chromium	< 25	≥ 25
Copper	< 25	≥ 25
Lead	< 40	≥ 40
Mercury	< 0.1	≥ 0.1
Nickel	< 20	≥ 20
Selenium	< 1.0	≥ 1.0
Manganese	< 300	≥ 300
Zinc	< 90	≥ 90
Iron	< 10,000	≥ 10,000
Other		
Ammonia	< 75	≥ 75
Cyanide	< 0.1	≥ 0.1
Phosphorus	< 420	≥ 420
Total Kjeldahl Nitrogen	< 1,000	≥ 1,000
Oil and Grease	< 1,000	≥ 1,000
Chemical Oxygen Demand	< 40,000	≥ 40,000
Volatile Solids	< 50,000	≥ 50,000

Table 2. Guidelines for the Classification of Great Lakes Sediments

Table 3. Wisconsin DNR 1989 Proposed Interim Guidelines for In-Water Placement of Dredged Material

Contaminant	Maximum Concentration	
Organics	Lake Michigan	Lake Superior
PCB, Total	0.05 ug/kg	0.05 ug/kg
Total 2,3,7,8 TCDD	1.0 pg/g	1.0 pg/g
Total 2,3,7,8 TCDF	10.0 pg/g	10.0 pg/g
Aldrin	0.01 ug/kg	0.01 ug/kg
Dieldrin	0.01 ug/kg	0.01 ug/kg
Chlordane	0.01 ug/kg	0.01 ug/kg
Endrin	0.05 ug/kg	0.05 ug/kg
Heptachlor	0.05 ug/kg	0.05 ug/kg
Lindane	0.05 ug/kg	0.05 ug/kg
Toxaphene	0.05 ug/kg	0.05 ug/kg
DDT	0.01 ug/kg	0.01 ug/kg
DDE	0.01 ug/kg	0.01 ug/kg
Metals		
Arsenic	10 mg/kg	10 mg/kg
Barium	500 mg/kg	500 mg/kg
Cadmium	1.0 mg/kg	1.0 mg/kg
Chromium	75 mg/kg	100 mg/kg
Copper	50 mg/kg	100 mg/kg
Lead	50 mg/kg	50 mg/kg
Mercury	0.1 mg/kg	0.1 mg/kg
Nickel	50 mg/kg	100 mg/kg
Selenium	1.0 mg/kg	1.0 mg/kg
Zinc	100 mg/kg	100 mg/kg
Other		
Oil & Grease	1000 mg/kg	1000 mg/kg

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APPENDIX G

St. Louis River AOC
Natural Resource Parcels

APPENDIX G.

NATURAL RESOURCE PARCELS LISTED IN METROPOLITAN
INTERSTATE COMMITTEE 1985 REPORT:
"SUPERIOR-DULUTH HARBOR NATURAL RESOURCES MANAGEMENT PROGRAM"
(Updated for Remedial Action Plan, 1992)

1. WISCONSIN POINT
Approximate Size: 300 acres Ownership: Public (City of Superior, WDNR, and Corps of Engineers).
Zoning: Undeveloped; Floodplain.
Features: Beach dune and pine forest habitats and critical status plant species present. Important bird habitat and migratory bird route. Nesting and young rearing habitat for colonial/nesting birds (common terns and piping plovers). High recreational value.

2. ALLOUEZ BAY
Approximate Size: 600 acres Ownership: Public (City of Superior)
Zoning: Undeveloped; Floodplain; Navigable waters; Wetlands.
Features: Extensive wetlands and shallow water habitat. Important fish and wildlife habitat.

3. MOUTH OF NEMADJI RIVER
Approximate Size: 90 acres Ownership: Public (Douglas Co.) and Private (Burlington Northern).
Zoning: Wetlands; Floodway; Navigable Waters.
Features: Wetlands, fish habitat.

4. HOG ISLAND
Approximate Size: 120 acres Ownership: Public (Douglas Co).
Zoning: Heavy Industry and Wetlands; Navigable Waters; Wetlands.
Features: Wetlands, shallow water habitat.

5. BARKER'S ISLAND
Approximate Size: 14 acres. Ownership: Public (City of Superior) and Private Parcels.
Zoning: Heavy Industry; Shoreland; Floodway.
Features: Previously contained designated bird sanctuary. No longer provides nesting habitat for colonial nesting bird species (common tern, piping plover) because of vegetative growth and human disturbance.

6. MINNESOTA POINT (outer undeveloped portion)
Approximate size: 200 acres Ownership: Public (City of Duluth, City of Superior, and Corps of Engineers).
Zoning: Residential, Floodplain, Shoreland.
Features: Pine forest and beach-dune habitats and associated critical status plant species. Importance on migratory bird route. Recreational value.

APPENDIX G cont.

NATURAL RESOURCE PARCELS LISTED IN METROPOLITAN
INTERSTATE COMMITTEE 1985 REPORT:
"SUPERIOR-DULUTH HARBOR NATURAL RESOURCES MANAGEMENT PROGRAM"
(Updated for Remedial Action Plan, 1992)

7. HEARDING ISLAND
Approximate Size: 32 acres plus adjoining shallow waters (approx, 50 acres)
Ownership: Public (State of Minnesota)
Zoning: General Development Shorelands; Floodway; Designated Wildlife Management Refuge.
Features: Colonial bird nesting site.

8. INTERSTATE ISLAND AND ADJACENT WATERS
Approximate Size: 200 acres Ownership: Public (State of Minnesota) and private (Burlington Northern Railroad and C. Reiss Coal Co.). Private lands managed by Wisconsin DNR.
Zoning: Not zoned, Floodway; Shoreland.
Features: Colonial bird nesting site (common terns).

9. WISCONSIN GRASSY POINT (shallow waters)
Approximate size: 140 acres Ownership: Public (Douglas Co. and City of Superior) and public
Zoning: Heavy industry; Shoreland.
Features: Wetlands, shallow waters, primary northern pike spawning area, waterbird habitat.

10. MINNESOTA GRASSY POINT (and adjacent islands)
Approximate size: 100 acres Ownership: Public (tax forfeit) and private.
Zoning: Waterfront; Shoreland; Floodplain; Wetland.
Features: Wetlands, shallow waters, primary northern pike spawning area, waterbird habitat.

11. CLOUGH (Whiteside) ISLAND
Approximate size: 370 acres plus adjoining waters.
Ownership: Private.
Zoning: Forestry; Shoreland; Wetlands.
Features: Marshes and waters adjoining island relativey undisturbed, natural state.

12. SUPERIOR MUNICIPAL FOREST (portion of) and POKEGAMA BAY
Approximate Size: 4500 acres Ownership: Public (City of Superior)
Zoning: Forestry; Shoreland; Navigable Waters: Wetlands.
Features: Boreal forest habitat. Bays, wetlands. Importance to fish and wildlife.

13. MORGAN PARK MUDFLATS AND SPIRIT ISLAND AREA
Approximate Size: 260 acres Ownership: Public (City of Duluth and Corps of Engineers).
Zoning: Manufacturing, Shoreland, Floodplain, Wetlands.
Features: Wetlands, shallow waters, mudflats, colonial bird nesting sites.

APPENDIX G cont.

NATURAL RESOURCE PARCELS LISTED IN METROPOLITAN
INTERSTATE COMMITTEE 1985 REPORT:
"SUPERIOR-DULUTH HARBOR NATURAL RESOURCES MANAGEMENT PROGRAM"
(Updated for Remedial Action Plan, 1992)

14. SPIRIT LAKE POINT (and adjoining wetlands)
Approximate Size: 50 acres. Ownership: Public (city of Duluth).
Zoning: Industrial; Shoreland; Floodplain; Wetlands.
Features: Wetlands, maple-basswood forest.

15. MUD LAKE (and adjacent wetlands)
Approximate size: 230 acres. Ownership: Public (City of Duluth)
Zoning: Commercial; Shoreland; Floodplain; Wetland.
Features: Wetlands and shallow water habitat.

16. SOUTH SPIRIT LAKE MARSH
Approximate Size: 240 acres (70 wetland and 170 shallow water).
Ownership: Public (Douglas Co. and Village of Oliver).
Zoning: Special Use; Wetland; Shoreland; Floodway.
Features: Wetlands and shallow water habitat.

17. OLIVER BRIDGE MARSH/BEAR ISLAND
Approximate Size: 120 acres Ownership: Public (City of Duluth) and Private
Zoning: Residential; Shoreland; Floodplain; Wetlands.
Features: Wetlands and shallow water habitat.

18. SOUTH HORSESHOE ISLAND AREA
Approximate Size: 200 acres Ownership: Public (State of Wisconsin) and Private (Werco Wisconsin).
Zoning: Forestry, Shoreland; Floodway; Wetlands.
Features: Wetlands and shallow water habitat. Nekuk and Arnik Islands and nearby islet owned by State of Wlisconsin, managed for natural and undisturbed nature.

19. SWAMP LAKE (Olson's Pond)
Approximate Size: 10 acres Ownership: Public (State of Minnesota) and Private
Zoning: Commercial; Floodway; Shoreland; State Park.
Features: Wetland. Green heron colony.

20. FOND DU LAC SPAWNING GROUNDS
Approximate size: 1-2/3 miles of river
Ownership: Public (State of Minnesota, State of Wisconsin) and Private.
Zoning: Suburban; Floodplain; Shoreland.
Features: Walleye spawning area.

APPENDIX G cont.

SITES WITHIN ST. LOUIS ESTUARY RATED AS VALUABLE NATURAL AREAS
BY WDNR SCIENTIFIC AREAS PROGRAM

ALLOUEZ BAY
Ownership: City of Superior
Description and Comments: Shallow bay. Emergent aquatic community, numerous submerged and floating leaved aquatics. Good interspersion of aquatics and open water, and numerous mud flats provide excellent waterfowl and shorebird habitat. A primary northern pike spawning area.

WISCONSIN POINT
Ownership: City of Superior
Description and Comments: Narrow sand spit into Lake Superior, about 2-1/2 miles long. Pine forest and open beach and dune communities. Critical plant species present.

DWIGHT'S POINT-KIMBALLS BAY AREA
Ownership: City of Superior
Description and Comments: Two mile peninsula into St. Louis River containing old-growth red and white pine among second growth mixed woodland. This is some of the best boreal forest remaining in the Lake Superior area. Long serpentine inland bays such as Kimballs and Pokegama Bays are unique in Wisconsin to this naturally flooded river mouth. Wetland lines much of the bays which is used extensively by waterfowl. This approximately 290-acre area has been given high protection priority by the Wisconsin DNR Natural Areas Program.

ST. LOUIS RIVER MARSH
Ownership: Private
Description and Comments: Area from Red River mouth to Pokegama River mouth. Submerged and emergent plant communities along St. Louis River, with some mud flats and shorebird habitat.

NEMADJI RIVER
Ownership: City of Superior, Private.
Description and Comments: River valley and extensively meandering river zone from below its confluence with the Black River to its mouth in Superior Bay. Sluggish river whose channel is deeply entrenched into red clay. The river fluctuates wildly and carries a heavy silt load. Adjacent swamp timber. Main value is erosion control and ecological corridor value.

POKEGAMA RIVER
Ownership: City of Superior
Description and Comments: Zone of emergent aquatics up to 350 ft. wide along each side of the Pokegama River near its drowned mouth. Current is slow and many floating leaved aquatics occur. This approximately 200-acre area is dominated by cattails, burreed, and wild rice.

ST. LOUIS RIVER AREA, NORTH AND WEST OF THE VILLAGE OF OLIVER
Very likely contains important endangered resources concerns. Systematic inventories of this area have not been conducted.

Source: MIC Report: Superior-Duluth Harbor Natural Resources Management Program, 1985.

Memo from R. Nicotera, Bureau of Endangered Resources, Wisconsin DNR to Bruce Bacon, November 1991.

APPENDIX H

Organic Chemicals in WLSSD Effluent, 1982

Appendix H. Organic Chemicals in WLSSD Effluent, 1982

C.A.S. #	Chemical Name
8253	7H-BENZ[DE]ANTHRACEN-7-ONE
*13513	BENZENE,1,2-DIETHYL-
51124	NAPTHALENE,DECAHYDRO-1,1,4A-TRIMETHYL-6-METHYLENE-5-(3-METHYLENE-4-P
*51445	BENZOICACID,3,4-DICHLORO-
*54126	CYCLOPENTASILOXANE,DECAMETHYL
58151	3H-PYRAZOL-3-ONE,4-(DIMETHYLAMINO)-1,2-DIHYDRO-1,5-DIMETHYL-2-PHENYL-
*63079	PENTATRIACONTANE
*65861	4-PYRIMIDINECARBOXYLICACID,1,2,3,6-TETRAHYDRO-2,6-DIOXO-
72559	BENZENE,1,1'-DICHLOROETHENYLIDENE)BIS[4-CHLORO-
76120	ETHANE,1,1,2,2-TETRACHLORO-1,2-DIFLUORO-
84151	1,1':2',1''-TERPHENYL
84651	9,10-ANTHRACENEDIONE
*84662	1,2-BENZENEDICARBOXYLICACID,DIETHYLESTER
84720	1,2-BENZENEDICARBOXYLICACID,2-ETHOXY-2-OXOETHYLETHYLESTER
86293	BENZENEACETONITRILE,.ALPHA.-PHENYL-
86737	9H-FLUORENE
87401	BENZENE,1,3,5-TRICHLORO-2-METHOXY
*91203	NAPTHALENE
91576	NAPTHALENE,2-METHYL
92524	1,1'-BIPHENYL
98271	PHENOL,4-(1,1-DIMETHYLETHYL)-2-METHYL-
*98293	1,2-BENZENEDIOL,4-(1,1-DIMETHYLETHYL)-
98577	BENZENE,1-CHLORO-4-(METHYLSULFONYL)-
112403	DODECANE
121335	BENZALDEHYDE,4-HYDROXY-3-METHOXY-
127253	1-PHENANTHRENECARBOXYLICACID,1,2,3,4,4A,4B,5,6,10,10A-DECAHYDRO-1,4A-D
*131704	1,2-BENZENEDICARBOXYLICACID, MONOBUTYLESTER
*206440	FLUORANTHENE
219987	DIBENZ[C,E]OXEPIN
230971	2-PROPENOICACID,3-(4-HYDROXY-3-METHOXYPHENYL)-,METHYLESTER
*240002	BENZENE,(1-ETHYLDECYL)-
273154	2,1,3-BENZOSELFNADIAZOLE
*328088	BENZENEETHANOL,ALPHA.,.ALPHA.,.BETA.-TRIMETHYL-
*481210	CHOLESTANE,(5.ALPHA.)-
483658	PHENANTHRENE,1-METHYL-7-(1-METHYLETHYL)-
486259	9H-FLUOPEN-9-ONE
486840	9H-PYPIDO[3,4-B]INDOLE,1-METHYL-
500992	PHENOL,3,5-DIMETHOXY-
518865	1H,3H-NAPHTHO[1,8-CD]PYRAN-1-ONE
*536607	BENZENEMETHANOL,4-METHYLETHYL)-
539742	PROPANOICACID,3-BROMO-,ETHYLESTER
*540976	CYCLOHEXASILOXANE,DODECAMETHYL-
*557619	1-OCTACOSANOL
612839	[1,1'-BIPHENYL]-4,4'-DIAMINE,3,3'-DICHLORO-,DIHYDROCHLORIDE
613127	ANTHRACENE,2-METHYL-
*629969	1-FICOSANOL
*638368	HEXADECANE,2,6,10,14-TETRAMETHYL-
638595	1-TETRADECANOL,ACETATE
645727	1-HEXADECANOL,3,7,11,15-TETRAMETHYL-
*719222	2,5-CYCLOHEXADTENE-1,4-DIONE,2,6-BIS(1,1-DIMETHYLETHYL)-
*734368	PHENANTHRENE,3,4,5,6-TETRAMETHYL-

C.A.S. #	Chemical Name
832644	PHENANTHRENE,4-METHYL-
*832699	PHENANTHRENE,1-METHYL-
*832713	PHENANTHRENE,3-METHYL-
873494	BENZENE,CYCLOPROPYL-
*883205	PHENANTHRENE,9-METHYL-
*886384	2-CYCLOPROPEN-1-ONE,2,3-DIPHENYL-
1008806	NAPTHALENE,DECAHYDRO-2,3-DIMETHYL-
*1235741	1-PHENANTHRENECARBOXYLICACID,1,2,3,4,4A,9,10,10A-OCTAHYDRO-1,4A-DIMETH
*1576698	PHENANTHRENE,2,7-DIMETHYL-
1587430	HEXADECANE,6,11-DIPENTYL-
1660623	1,1'-BIPHENYL,2,4',5-TRICHLORO-
1758889	BENZENE,2-ETHYL-1,4-DIMETHYL
1760276	2H-FURO(2,3-H)-1-BENZOPYRAN-2-ONE,8-(1-METHYLETHENYL)-
1825957	1,1'-BIPHENYL,2,3,4,5,6-PENTACHLORO-
1897456	1,3-BENZENEDICARBONITRILE,2,4,5,6-TETRACHLORO-
1905148	BENZENEILIDE,2'-ACETONYL-
1918112	PHENOL,2,6-BIS(1,1-DIMETHYLETHYL_4-METHYL-,METHYLCARBAMATE
*1953997	1,2-BENZENEDICARBONITRILE,3,4,5,6-TETRACHLORO-
2050682	1,1'-BIPHENYL,4,4'-DICHLORO-
2053447	.DELTA.2-TETRAZABOPOLINE,1,4,5-TRIETHYL-
2203765	SELENACYANICACID,P-(ETHYLMETHYLAMINO)PHENYLESTER
2245387	NAPHTALENE,1,6,7-TRIMETHYL-
2489863	NAPTHALENE,1-(2-PROPENYL)-
*2490484	1-HEXADECANOL,2-METHYL-
*2656442	ASPIDOFRACTININE-3-METHANOL,2.ALPHA.,3.BETA.,5.ALPHA.)-
2719611	BENZENE,(1-METHYLUNDECYL)-
*2719622	BENZENE,(1-PENTYLHEPTYL)-
2852688	METHANONE,BIS(3-METHYLPHENYL)-
2958761	NAPHTHALENE,DECAHYDRO-2-METHYL-
3424826	BENZENE,1-CHLORO-2-[2,2-DICHLORO-1-(4-CHLOROPHENYL)ETHENYL]-
3485629	1-AZONIAPICYCLO[2,2,2]OCTANE,3-[(HYDROXYDIPHENYLACETYL)OXY]-1-METHYL-,
3599766	1,3,5-TRIAZINE,2-(METHYLTHIO)-4,6-BIS(TRICHLOROMETHYL)-
3615472	D-GLUCOSE,2,3,4,6-TETRA-O-METHYL-
*3674655	PHENANTHRENE,2,3-DIMETHYL-
*3910358	1H-INDENE,2,3-DIHYDRO-1,1,3-TRIMETHYL-3-PHENYL-
4308994	BENZOICACID,2-(PHENYLTHIOXOMETHYL)HYDRAZIDE
4536883	BENZENE,(1-METHYLDECYL)-
4630813	CYCLOHEXANECARBOXYICACID,1-ETHYL-,METHYLESTER
4707339	2H-NAPTHO[2,3-B]PYRAN-5,10-DIONE,3,4-DIHYDRO-2,2-DIMETHYL-
5103742	4,7-METHANO-1H-ANDENE,1,2,4,5,6,7,8,8-OCTACHLORO-2,3,3A,4,7,7A-HEXAHYD
5257217	.ALPHA.-D-XYLOSURANOSE,CYCLIC1,2:3,5-BIS(BUTYLBORONATE)
5271246	1,1'-BIPHENYL,2,2'3,4,5,5'-HEXACHLORO-
*5353253	ETHANOL,2-(9-OCTADECENYLOXY)-,(Z)-
5414197	ETHANE,1,1'-OXYBIS[2-BROMO-
5504551	1H-AZEPINE,HEXAHYDRO-1-(2-NAPHTHALENYL)-
5528225	CYCLOHEXANE,1,4-DIMETHYL-2-OCTADECYL-
5533493	CYCLOHEXANE,1,1'-DODECYLIDENEBIS[4-METHYL-
*5681821	BENZENE,1,2,3,5-TETRACHLORO-4-ETHOXY-
*5681832	.BENZENE,(PENTACHLOROETHOXY)-
5681865	NAPHTHALENE,1,2,3,4-TETRAHYDRO-2-1-(1-NAPHTHALENYLMETHYL)-
6494695	2-PHENAZINAMINE,N,N-DIMETHYL-

C.A.S. #	Chemical Name
*6831170	2H-CYCLOPROPA[A]NAPHTHALEN-2-ONE,1,1A,4,5,6,7,7A,7B-OCTAHYDRO-1,1,7,7A
7012375	1,1'-BIPHENYL,2,4,4'-TRICHLORO-
*7098217	TRITETRACONTANE
7320538	DIBENZOFURAN,4-METHYL-
7383906	1,1'-BIPHENYL,3,4'-DIMETHYL-
7521382	4H-PYRAN-4-ONE,3-ACETYL-2,6-DIMETHYL-
7594867	PERYLENE,1,2,3,3A,4,5,6,7,8,9,9A,10,11,12-TETRADECAHYDRO-
10152699	CYCLOPROPANEONANDICACID,2-[(2-BUTYLCYLOPROPYL)METHYL]-,METHYLESTEI
10224916	ETHANE,1,1-BIS(P-ETHYLPHENYL)-
*10544500	SULFUR,MOI.(S8)
*13287213	TRIDECANE,6-METHYL-
13540562	BENZENE,1,2-DIMETHYL-4-(PHENYLMETHYL)-
*13601882	1-PHENANTHRENECARBOXALDEHYDE,1,2,3,4,4A,9,10,10A-OCTAHYDRO-1,4A-DIMET
13656810	2,4,6-CYCLOHEPTATRIEN-1-ONE,4-(1-METHYLETHYL)-
14132195	1,2-CYCLOBUTANEDICARBOXYLICACID,3-METHYL-,DIMETHYLESTER
14212874	MORPHOLINE,4,4'-ETHENYLIDENEBIS-
14495411	1,2,3,4-CYCLOBUTANETETRACARBOXYLICACID,TETRAMETHYLESTER()
*14676529	2-BIPHENYLACETICACID
*14850238	4-OCTANE,(E)-
15155621	1-DOCOSANOL,FORMATE
16511481	PHENANTHRIDINIUM,5,6-DIMETHYL-,IODIDE
*16587341	NAPHTHO(2,3-B)THIOPHENE,4,9-DIMATHYL-
16587523	DIBENZOTHIOPHENE,3-METHYL-
16983601	3-PENTEN-2-ONE,3,4-DIMETHYL-,SEMICARBAZONE
17302237	NONANE,4,5-DIMETHYL-
17384724	CYCLOPENT[A]INDENE,3,8-DIHYDRO-1,2,3,3,8,8-HEXAMETHYL-
17629275	PYRAZOLE,3-(P-CHLOROPHENYL)-5-METHYL-
*17851535	1,2-BENZENEDICARBOXYLICACID,BUTYL2-METHYLPROPYLESTER
18593265	10(5h)-ACRIDOPHOSPHINENE,5-HYDPOXY-,5-OXIDE
*18793196	PYRIDINE,3,3'-(2,4-PIPERIDINEDIYL)BIS-
*19407284	PHENANTHRENE,1,2,3,4,4A,9,10,10A-OCTAHYDRO-1,1,4A-TRIMETHYL-7-(1-METHYL-
19690596	HYDRAZINE,(4-CHLORO-2-METHYLPHENYL)-,MONOHYDROCHLORIDE
19962653	1,3-DIOXOLAN-4-ONE,5,5-DIPHENYL-
20273272	BICYCLOHEXYL,4-PHENYL-
*21113553	BENZENE,1,1'-CYCLOHEXYLIDENEBIS-
23246120	1,2,4-TRIOXOLANE,3,3,5-TRIPHENYL-
*24035505	1-PHENANTHRENECARBOXALDEHYDE,1,2,3,4,4A,9,10,10A-OCTAHYDRO-1,4A-DIMET
25117311	TRIDECANE,5-METHYL-
25323686	1,1'-BIPHENYL,TRICHLORO-
26537495	SYDNONE,3-(3,3-DIMETHYLBUTYL)-
26601649	1,1'-BIPHENYL,HEXACHLORO-
26891667	PYRIDINE,2-(BUTYLTHIO)-
26914330	1,1'-BIPHENYL,TETRACHLORO-
31083600	TRICYCLO[4.3.1.18,8]UNDECANE-1-CARBOXYLICACID,METHYLESTER
32363512	4(3H)-PYRINIDINONE,2,3,6-TRIMETHYL-
33933732	THIOPHENE,2-METHYL-5-PROPYL-
34793641	1,4-PENTADITN-3-ONE,1,5-BIS(4-METHYLPHENYL)-
36093999	4-THIAZOLEMETHANOL,2-(4-CHLOROPHENYL)-
36628805	BICYCLO[4.4.1]UNDECA-1,3,5,7,9-PENTAEN-11-ONE
*37712791	2-PIPEREDINONE,1-(1-METHYLETHYL)-3-[(1-METHYLETHYL)AMINO]-
39707545	1,4-BENZENEDIOL,2-[(DECAHYDRO-5,5,8A-TRIMETHYL-2-METHYLENE-1-NAPHTHALI

Appendix H. Organic Chemicals in WLSSD Effluent, 1982

C.A.S. #	Chemical Name
*40071703	CHOLESTANE,(5.ALPHA.,14.BETA.)-
40938214	BUTANEDIOICACID,(2,2-DIMETHYLPROPYLIDENE)-
41464408	1,1'-BIPHENYL,2,2',4,5'-TETRACHLORO-
51677384	1-PENTANAMINE,N-(1-PENTYLHEXYLIDENE)-
51791162	FICOSANE,2,6,10,14,18-PENTAMETHYL-
*51794162	EICOSANE,2,6,10,14,18-PENTAMETHYL-
52161543	BENZENE,1,1'-(1,4-DIMETHYL-1-BUTENE-1,4-DIYL)BIS-
53690894	2-CYCLOPENTEN-1-ONE,5-BUTYL-3-METHOXY-
54340942	2-BUTANONE,4-BUTOXY-3-METHYL-
54484694	HYDROXYLAMINE,0-(2-NAPHTHALENYLMETHYL)-
54725165	2H-INDEN-2-ONE,1,4,5,6,7,7A-HEXAHYDRO-7A-METHYL-,(S)-
54883602	2,4-IMADAZOLIDINEDIONE,5-(3-METHOXYPHENYL)-3-METHYL-5-PHENYL-
54964828	OCTADECANE,2,6,10,14-TETRAMETHYL-
55044592	1,2-BENZENEDICARBOXYLICACID,4-METHYL-5-(1-METHYLETHYL)-,DIMETHYLESTEF
55044752	7-HEPTADECENE,7-METHYL-,(E)-
*55124806	NONADECANE,2,6,10,14-TETRAMETHYL-
55133829	1H-BENZ[DE]ISOQUINOLINE-1,3(2H)-DIONE,5-METHOXY-2-METHYL-
*55162566	2,5-CYCLOHEXADIEN-1-ONE,4,4-DIMETHYL-3-PHENYL-
*55320724	BENZOICACID,2-(METHYLAMINO)-,PROPYLESTER
55334220	PHENANTHPENE,2-DODECYLTETRADECAHYDRO-
55373994	1H-CARBAZOLE-2-ETHANAMINE,3-ETHYL-2,3,4,9-TETRAHYDRO,N,N,1-TRIMETHYL-
55538711	1,4-AUTHRACENEDIONE,2-HYDROXY-5-METHYL-
55702459	1,1'-BIPHENYL,2,3,6-TRICHLORO-
55702460	1,1'-BIPHENYL,2,3,4-TRICHLORO-
56114466	2-PYRIDINEACETALDEHYDE,[2-(2-PYRIDINTL)ETHYLIDENE]HYDRAZONE
56143341	PREGNAN-18-OICCACID,20-HYDROXY-..GAMMA.-LACTONE,(5.ALPHA.)-
56324711	1H-INDENE,1-ETHYLOCTAHYDRO-7A-METHYL-,(1.ALPHA.,31.BETA.,7A.ALPHA)-
56554995	3-OCTADECENAL
56666434	PYROLIDINE,1-[1-OXO-5-(3-UNDECYLOXIRANYL)PENTYL]-
56701178	CYCLOPROPANECARBONYLCHLORIDE,1-FLUORO-2,2-DIPHENYL-
56771507	TRICYCLO[5.2.1.02,5]NONA-3,8-DIEN-6-OL,6-PHENYL-,(1.ALPHA.,2.BETA.,5.B
*56771701	L-ORNITHINE,N2,N5-BIS(1-METHYLETHYL)-,1-METHYLETHYLESTER
*57289266	1-DODECANOL,2-METHYL-,(S)-
58066765	XYLITOL,CYCLIC1,2:3,5-BIS(ETHYLBORONATE)4-(DIETHYLBORINATE)
*61141193	2(1B)-PHENANTHRENONE,3,4,4A,9,10,10A-HEXAHYDRO-1,1,4A-TRIMETHYL-
61141988	CYCLOHEXANE,1-(2,2-DIMETHYLPROPYL)-3,5-DIETHENYL-2-METHYL-
61142549	BORINICACID,DIPROPYL-,2-PROPYL-1,3,2-DIOXABORINAN-5-YLESTER

*Chemical found in both influent and effluent

APPENDIX I

Listing of Endangered Flora and Fauna
in the St. Louis River AOC

Appendix I. Endangered Plants

SPECIES NAME	COMMON NAME	RATING	COUNTY LOCATION
Adoxa moschatellina	Monchatel	Special Concern	Carlton\St. Louis
Allium Schoenoprasum (silibircum)	Wild Chives	Special Concern	Carlton\St. Louis
Ammophila breiligulata	Beach Grass	Threatened	St. Louis
Arethusa bulbosa	Dragon's-mouth	Special Concern	Carlton\St. Louis
Calamagrostis lacustris	Marsh Reedgrass	Endangered	St. Louis
Caltha natans	Floating Marsh Marigold	Endangered	St. Louis
Carex exilis	Sedge Species	Special Concern	St. Louis
Carex garberi	Garber's Sedge	Endangered	St. Louis
Carex katahinensis	Mount Katahdin Sedge	Endangered	St. Louis
Carex pallescens	Pale Sedge	Endangered	St. Louis
Carex rossii	Ross's Sedge	Endangered	Carlton\Pine
Cetraria aurescens	Lichen species	Special Concern	St. Louis
Cirsium hillii	Hill's Thistle	Special Concern	Pine
Cladium mariscoides	Twig-rush	Special Concern	Pine
Cladonia pseudorangiformis	Lichen Species	Special Concern	St. Louis
Claytonia caroliana	Carolina Spring-beauty	Special Concern	Carlton/St. Louis

Appendix I cont. Endangered Plants			
SPECIES	**COMMON NAME**	**RATING**	**COUNTY**
Cypripendium arietinum	Ram's-head Lady's-slipper	Endangered	Itasca
Decodon verticllatus	Water-willow	Special Concern	Pine
Deschampsia flexuosa	Slender Hairgrass	Special Concern	St. Louis
Elecharis pauciflora (fernaldii)	Few-flowered Spike-rush	Special Concern	St. Louis
Elocharis nitida	Neat Spike-rush	Endangered	St. Louis
Euphraia hudsoniana	Hudson Bay Eyebright	Special Concern	St. Louis
Hydrocotyle americana	American Water-pennywort	Special Concern	Pine
Juncus stygius (americanus)	Bog Rush	Special Concern	St. Louis
Listeria auriculata	Auricled Twayblade	Endangered	Carlton/St. Louis
Littorella americana	American Shore-plantain	Endangered	St. Louis
Lorbaria quercizans	Lichen Species	Threatened	St. Louis
Muhlenbergia uniflora	One-flowered Muhly	Threatened	St. Louis
Phacelia franklinii	Wild Heliotrope	Treatened	St. Louis
Platanthera clacellata	Club-spur Orchid	Special Concern	St. Louis
Poa paludigena	Bog Bluegrass	Endangered	Pine
Polygonum arifloium	Halberd-leaved Teardthumb	Special Concern	Pine

Appendix I cont. Endangered Plants			
SPECIES	**COMMON NAME**	**RATING**	**COUNTY**
Polydonum careyi	Carey's Smartweed	Endangered	Carlton
Polygonum viviparum	Alpine Bistort	Special Concern	St. Louis
Potamogeton vaaseyi	Vasey's Pondweed	Special Concern	St. Louis
Pseudocyphellaria crocata	Lichen Species	Endangered	St. Louis
Pyrola minor	Small Shinleaf	Special Concern	St. Louis
Rancunculus lapponicus	Lapland Buttercup	Special Concern	St. Louis
Rhynochospora fusca	Sooty Colored Beak-rush	Special Concern	St. Louis
Salix pellita	Satiney Willow	Special Concern	St. Louis
Sparganium golmeratum	Clustered Bur Reed	Endangered	St. Louis
Stricta fuliginosa	Lichen Species	Special Concern	St. Louis
Subularia aquatica	Awlwort	Endangered	St. Louis
Tillaea aquatica	Pigmyweed	Endangered	St. Louis
Tomenthypnum falcifolium	Moss Species	Special Concern	St. Louis
Triglochin palustris	Marsh Arrow-grass	Special Concern	St. Louis
Tsuga canadensis	Eastern Hemlock	Special Concern	Carlton/Pine/St.Louis
Utricularia gibba	Humped Bladderwort	Special Concern	St. Louis
Vaccinium vitis-idaea	Mountain Cranberry	Endangered	Douglas
Viola novae-angliae	New England Violet	Special Concern	Carlton/St. Louis

Appendix I cont. Endangered Plants			
SPECIES	**COMMON NAME**	**STATUS**	**COUNTY LOCATION**
Waldsteinia fragrioides	Barren Strawberry	Special Concern	Pine/St. Louis
Xyris montana	Yellow-eyed Grass	Special Concern	St. Louis

Appendix I. Endangered Animals

SPECIES	COMMON NAME	STATUS	COUNTY LOCATION
Acipenser fulvescens	Lake Sturgeon	Special Concern	Pine\St. Louis
Bartramia longicauda	Upland Sandpiper (Plover)	Special Concern	Itasca\St. Louis
Botaurus lentiginosus	American Bittern	Special Concern	St. Louis
Buteo liniatus	Red-Shouldered Hawk	Special Concern (MN) Threatened (WI)	Pine Douglas
Canis lupus	Gray Wolf	Threatened (MN) Endangered (WI)	Carlton\Itasca\Pine\St.Louis Douglas
Casmerodius albus	Great Egret	Threatened	Douglas
Charadrius melodus	Piping Plover	Endangered	St. Louis\Douglas
Chelydra serpintina	Snapping Turtle	Special Concern	Carlton\Itasca\Pine\St.Louis
Cicindela denkikei	Tiger Beetle	Endangered	St. Louis
Cicindela hirticollis shermani	Tiger Beetle	Special Concern	St. Louis
Cicindela petruela petruela	Tiger Beetle	Threatened	Pine
Clemmys insculpta	Wood Turtle	Threatened	Pine\St. Louis\Douglas
Clossiana freija	Frija Frillary	Special Concern	Carlton\Itasca\Pine\St.Louis
Clossiana frigga saga	Frija Frillary	Special Concern	Pine\St. Louis

Appendix I cont. Endangered Animals			
SPECIES	**COMMON NAME**	**STATUS**	**COUNTY LOCATION**

Cygnus buccinator	Trumpeter Swan	Endangered	Douglas
Elaphe vulpina	Fox Snake	Special Concern	Pine
Emydoidea blandingii	Blanding's Turtle	Threatened	Pine\Douglas
Epidemia dorcas dorcas	Dorcas Copper	Special Concern	Carlton\Itasca\Pine\St.Louis
Elaphe epixaphe michoganesis	Bog Copper	Special Concern	Carlton\Itasca\Pine\St. Louis
Erebia disa manicnus	Disa Alpine	Special Concern	St. Louis
Erebia discoidalia	Red-disked Alpine	Special Concern	Carlton\Itasca\Pine\St.Louis
Falco peregrinus	Peregrin Falcon	Endangered	Douglas\St. Louis
Grus cana densis	Sandhill Crane	Special Concern	Pine
Haliaetus Leucocephalus	Bald Eagle	Threatened	Carlton\Itasca\Pine\St.Louis\Douglas
Heterodon plarhinos	Eastern Hognose Snake	Special Concern	Pine
Lanius ludovicianus	Loggerhead Shrike	Threatened Endangered	St. Louis Douglas
Lycaeides idas	Northern Blue Butterfly	Endangered	Douglas
Lynx canadensis	Canada Lynx	Endangered	Douglas
Marpissa grata	Jumping Spider	Special Concern	Carlton
Martes americana	Marten	Special Concern	St. Louis
Mircotus chrotorrhinus	Rock Vole	Special Concern	St. Louis
Myotis septentrionalis	Northern Myotis	Special Concern	Itasca\Pine\St. Louis
Odocoileus hemionus	Mule Deer	Special Concern	Itasca
Oeneis Jutta ascerta	Jutta Arctic	Special Concern	Carlton\Pine\St. Louis
Pandion haliatus	Osprey	Special Concern (MN) Threatened (WI)	Itasca\Pine\St. Louis Douglas
Phenacomys intermedius	Heather Vole	Special Concern	St. Louis
Pipistrellus subflavus	Eastern Pipistrelle	Special Concern	St. Louis

Appendix I cont. Endangered Animals			
SPECIES	**COMMON NAME**	**STATUS**	**COUNTY LOCATION**
Podiceps grisegena	Red-necked Grebe	Threatened	Douglas
Proclossiana eunomia dawsoni	Bog Fritillary	Special Concern	St. Louis
Rangifer tarandus	Caribou	Special Concern	St. Louis
Seiurus motacilla	Louisiana Waterthrush	Special Concern	Pine
Spilogale putorius	Eastern Spotted Skunk	Special Concern	Itasca\Pine\St. Louis
Sterna caspia	Caspian Tern	Endangered	Douglas
Sterna hirundo	Common Tern	Special Concern Endangered	St. Louis Douglas

APPENDIX J

Part A

Compilation of Documented Spills and/or Accidental Releases
into the St. Louis River Drainage Basin
for the State of Minnesota

Appendix J. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
10/17/90	WLSSD	Duluth/Endion	Wastewater	Mod. Rain	*
8/31/90	WLSSD	Duluth/Endion	Sewage	Heavy Rain	20,000 g
8/25/90	WLSSD	Duluth/Becks Rd.	Foam	Seal Failure	*
8/25/90	WLSSD	Duluth Plant	Wastewater	Heavy Rains	*
8/25/90	WLSSD	Duluth/Endion	Wastewater	Heavy Rains	110,000 g
8/25/90	WLSSD	Duluth/Endion	Wastewater	Lighting	840,OO0 g
4/29/90	WLSSD	Duluth Plant	Wastewater	Pump Repairs	600,000 g
4/27/90	WLSSD	LSPI Station	Wastewater	Failed Alarm	*
4/26/90	WLSSD	Duluth/77th A.W.	Sewage	Vandalized	350,000 g
12/19/89	Duluth	*	Petroleum	Overfill	80 g
10/25/89	Viking Explosives	Aurora	Fuel Oil	AST	*
10/24/89	City of Duluth	Duluth	Fuel Oil	UST	6 g
10/16/89	USX Corporation	Mt. Iron	Fuel Oil	UST	*
10/11/89	Skubick Bros.	Virginia	Waste Oil	UST	*
10/10/89	Curtis Oil	Hermantown	Gasoline	UST	*
10/10/89	Lampert Lumber Center	Hibbing	Fuel Oil #2	UST	*
10/05/89	Northern Engine Supply	Proctor	Fuel OIl	UST	*
10/04/89	Minnesota Power	Thomson	Gasoline	UST	*

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
9/29/89	Miller Homes	Duluth	Petroleum	UST	*
9/26/89	*	Duluth	Oil	Spill	*
9/26/89	Azcon Corp.	Duluth	Petroleum	Spill	*
9/26/89	Century Mercury Motor Freight	Duluth	Gasoline	UST	*
9/26/89	Century Mercury Motor Freight	Duluth	Gasoline	UST	*
9/25/89	Ship	Duluth	Fuel Oil #5/6	Ship	*
9/25/89	Duluth Harbor	Duluth	Petroleum	UST	*
9/25/89	WC Ship	Duluth	Fuel Oil #5	Ship	*
9/23/89	Amoco	Hibbing	Gasoline	UST	*
9/20/89	Yellow Freight	Duluth	Petro/Soil	UST	250 yards
9/13/89	US West Communications	Duluth	Fuel Oil	UST	*
9/12/89	Spirit Valley Little Store	Duluth	Petro/Soil	UST	*
9/11/89	US West Communications	Duluth	Fuel Oil	UST	*
9/07/89	Eddies Supper Club	Proctor	Petroleum	UST	*
9/06/89	US West Communications	Cloquet	Fuel Oil	UST	*
8/31/89	Potlatch	Cloquet	Lime Slurry	Pump Failure	20 g
7/12/89	Cutler Magner Co.	Duluth	Gasoline	UST	*
7/11/89	Amoco	Duluth	Gasoline	Overfill	*

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
7/10/89	Richard Barry	Virginia	Petroleum	UST	*
6/29/89	*	West Duluth	Explosives	Fireworks Fact.	*
6/28/89	Trico Oil Co.	Two Harbors	Petroleum	UST	*
6/13/89	Seven-Eleven	Duluth	Gasoline	Dispenser Accident	10 g
6/10/89	*	Aurora	Gasoline	Car Accident	20 g
6/08/89	Mariner Canadian Ship	Duluth	Oil Base Paint	Spill	1 g
6/07/89	Bank	Hibbing	Fuel Oil	UST	*
6/06/89	Cliff Knutson	Biwabik	Fuel Oil	AST	150 g
6/01/89	Virginia Public Utilities	Virginia	Askaral	Spill	1/2 cup
5/23/89	Minnesota Power	Duluth	Hydraulic Oil	Truck	20 g
5/16/89	WLSSD	Duluth	Sewage	Sewer Break	*
5/15/89	MNDOT	Cromwell	Fuel Oil	UST	*
5/09/89	Union Carbide Plant	Duluth	Fuel Oil	UST	*
5/05/89	Holmes Construction Inc.	Cloquet	Gasoline	UST	*
4/14/89	Jack & Don’s	Hibbing	Waste Oil	Salvage Runoff	*
4/07/89	City of Duluth	Duluth	Petroleum	UST	*
4/05/89	Hanna Mining	Nashwauk	Hydraulic Fluid	Back Hoe Accident	100 g
3/27/89	Tire Cycle	Babbitt	Fuel Oil	UST	*

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
3/18/89	Como Oil Co.	Duluth	Fuel Oil	Fuel Delivery	30 g
3/14/89	City of Duluth	Duluth	Gasoline	UST	*
3/09/89	Wehr Jerrod	Cloquet	Fuel Oil	Fuel Transfer Accident	50 g
3/03/89	Jon Widen	Duluth	Fuel Oil	UST	200 g
2/15/89	WLSSD	Duluth LS 37th	Sewage/Wastewater	Valve Failure	*
2/15/89	WLSSD	Duluth	Wastewater	Valve Failure	*
2/15/89	*	Aurora	Fuel Oil	UST	*
2/08/89	Proctor City	Proctor	Sewage	Clogged Sewer	3000 g
2/07/89	Como Oil Co.	Duluth	Fuel Oil	Equipment Failure	10 g
1/25/89	Domex	Hibbing	Petroleum	Spill	*
1/23/89	St. Louis Co. Federal	Duluth	Fuel Oil	UST	*
1/20/89	Indianhead Truck Line	Virginia	Gasoline	Valve Left Open	8600 g
1/17/89	DM&IRR	Proctor	Gasoline	Line Leak	50 g
1/11/89	MNDOT	Duluth	Fuel Oil	UST	1600 g
1/10/89	Equipoise Leasing Co.	Duluth	Fuel Oil	Truck Accident	100 g
1/02/89	WLSSD	Scanlon	Sewage	Power Failure	500000 g
1/02/89	WLSSD	Scanlon	Sewage/Wastewater	Pump Failure	500000 g
12/29/88	WLSSD	Cloquet	Sewage/Wastewater	Power Failure	401000 g

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
6/13/88	Potlatch	Cloquet	Liquid Ammonia	Clogged Hose	600 g
5/11/88	*	Proctor	Fuel Oil	UST	*
5/09/88	Security Oil Co.	Cloquet	Leaded Gasoline	UST	1000 g
5/06/88	WLSSD	Duluth	Diesel	Truck Accident	50 g
4/15/88	US Steel	Mt. Iron	Fuel Oil #2	Overfill	7000 g
4/05/88	Gambucci Hardware	Habbing	Gasoline	UST	*
3/25/88	National Steel Pellet Co.	Keewatin	Transformer Oil	Spill	50 g
3/09/88	Wherley Moving & Storage	Hibbing	Diesel Oil	Truck	100 g
3/04/88	MNDOT	Duluth	Hydraulic Oil	Leak	*
2/26/88	Road Machinery Service	Virginia	Hydraulic Oil	Truck	50 g
2/15/88	NECA	Hibbing	Mineral Oil	Transformer	1 g
2/05/88	MP&L	Duluth	Mineral Oil	Transformer	159 g
2/04/88	Dahlen Transport	Duluth	Gasoline	Truck	15 g
1/15/88	Louisiana Pacific Waferboard	Two Harbors	Waste Chemical	Dumping	16500 g
1/06/88	Virginia Public Utility	Virginia	Mineral Oil	Transformer	2 g
12/18/87	Minntac	Mt. Iron	Diethylene Glycol	AST	12000 g
12/18/87	Buckley Bros.	Cloquet	Ammonia Hydroxide	Truck Accident	1500 g
11/10/87	Superwood	Duluth	Waste Oil	Valve Failed	50 g

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
10/15/87	Jacks Mobile	Duluth	Gasoline	UST	*
8/17/87	WLSSD	Scanlon/Div E	Sewage/Wastewater	*	19.3 mg
8/01/87	Marine Fueling	Two Harbor	Fuel Oil	Hose Problem	10000 g
7/28/87	ICO	Duluth	Fuel Oil	Overfill	37 g
7/23/87	Edwards Oil	Virginia	Fuel Oil	Mone Tank	230 g
7/16/87	Minnesota Power	Babbitt	Mineral Oil	Transformer	40 g
7/13/87	Virginia Public Utility	Virginia	PCB	Transformer	1 g
5/18/87	Minntac	Mt. Iron	Mineral Oil	Transformer	100 g
5/15/87	Great Lakes Gas	Cloquet	PCB	Inverter Failed	*
5/08/87	Stock Tire	Cloquet	Fire Water	Fire	*
5/05/87	WLSSD	Duluth	Wastewater	Overflow	750000 g
3/26/87	Potlatch	Cloquet	Wastewater	Line Leak	1000 g
3/07/87	Erickson Dairy	Scanlon	Diesel	Truck	30 g
2/19/87	WLSSD	Scanlon/Div E	Sewage/Wastewater	Installation	*
2/06/87	WLSSD	LS #12	Wastewater	Line Replaced	300000 g
2/04/87	WLSSD	Duluth LS 49th	Sewage	Clogged w Debris	*
2/03/87	Security Service	Hibbing	Gasoline	UST	*
1/16/87	David Ang	Duluth	Fuel Oil	AST	200 g

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
1/06/87	Halvor Lines	Duluth	Diesel Fuel	Saddle Tank Spill	50 g
1/03/87	Koch Services	Duluth	Gasoline	Overfill	400 g
12/29/86	*	Duluth	Gas/Oil	Truck	20 g
12/19/86	*	Chisholm	Fuel Oil	Sewer	*
12/16/86	Food-n-Fuel	Duluth	Gasoline	Overfill	5 g
11/26/86	Hanna Mining Corp.	Keewatin	Mine Tailings	Vavle Leak	75000 g
11/24/86	Eveleth Mines	Eveleth	PCB Oils	Transformer	*
11/13/86	*	Duluth	Waste Oil	Dumped	2 g
10/31/86	Potlatch	Cloquet	Hydraulic Oil	Equipment Failure	17 g
10/19/86	McKinney	Cloquet	Fuel Oil	AST	5000 g
10/15/86	ICO	Duluth	Gasoline	UST	*
10/02/86	WLSSD	Duluth/Endion	Wastewater	Cleansing Line	24000 g
9/30/86	WLSSD	Duluth/Endion	Wastewater	Cleansing Line	132500 g
9/24/86	WLSSD	Duluth/Endion	Wastewater	Cleansing Line	82500 g
9/22/86	Mike Vesapovich	Eveleth	Diesel	Truck Spill	100 g
9/22/86	Todd Pietrowski	Duluth	Diesel	*	15 g
9/11/86	Kayo	Cloquet	Gasoline	UST	*
8/29/86	Redwood Falls	Duluth	Diesel	Truck Spill	100 g

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
8/29/86	Safety Kleen	Duluth	Mineral Spirits	Truck Spill	4 g
8/29/86	J & H Foods	Duluth	Diesel	Truck Spill	100 g
8/12/86	Minnesota Power	Cloquet	Hydraulic Fluid	Derrick Spill	50 g
7/30/86	DM&IRR	Proctor	Fuel Oil	Locomotive	150 g
7/30/86	Hallett Dock	Duluth	Waste Oil	Vandals/AST	200 g
7/21/86	Superwood	Duluth	Waste Oil	Valve Problem	250 g
7/14/86	USG	Cloquet	Petroleum	Transformer	*
7/11/86	Curtis Oil Co.	Duluth	Diesel	Overfill	50 g
7/11/86	Mrs. McKay	Duluth	Diesel	Leak	15 g
6/21/86	WLSSD	Scanlon	Wastewater	Power Failure	2 mg
6/21/86	Hibbing Taconite	Hibbing	Diesel	*	750 g
6/20/86	US Steel Corp.	Mt. Iron	PCB Oils	Transformer	21 g
6/19/86	Amoco	Grand Marais	Gasoline	Overfill	*
6/19/86	US Forest Service	Eveleth	2,4 D	Spill	Barrel - 50 g
6/16/86	ICO	Gilbert	Fuel Oil	UST	*
6/14/86	*	Mt. Iron	Gasoline	*	2 g
6/13/86	*	Duluth	Drain Oil	Tipped Bucket	2 g
6/13/86	US Steel Mintac	Mt. Iron	Mineral Oil	Transformer Spills	40 g

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
6/10/86	Edwards Oil	Virginia	Gasoline	UST	966 g
6/03/86	Babbitt School Dist.	Babbitt	Fuel Oil #5	UST	*
6/01/86	WLSSD	Duluth/Endion	Wastewater	Televising/Inspections	250000 g
5/28/86	Minnesota Power	Cloquet	Lube Oil	Assoc. w/Hydro Dam	50 g
5/13/86	Potlatch	Cloquet	Process Water	Seepage	1 g
5/13/86	James Anderson	Duluth	Waste Oil	Barrel Tipped	27 g
5/13/86	WLSSD	Duluth	Wastewater	Bypass	140000 g
5/13/86	North City Aviation Inc.	Duluth	Aviation Fuel	Overfill	50 g
5/07/86	Phillips 66	Virginia	Gasoline	UST	*
5/05/86	WLSSD	Esko	Wastewater	Pipeline Relocation	6.8 mg
5/05/86	WLSSD	Scanlon	Wastewater	Pipeline Replacement	28. mg
4/28/86	WLSSD	Esko	Wastewater	Pipeline Replacement	8. mg
4/28/86	WLSSD	Esko	Wastewater	Pipeline Relocation	1 mg
4/18/86	*	Hibbing	Oil	Well	*
4/08/86	DM&IRR	Proctor	Crank Case Oil	Assoc. w/Locomotive	150 g
4/02/86	Minnesota Hospital	Moose Lake	Gasoline	UST	*
4/01/86	Great Lakes Gas	Cloquet	Waste Oil	Facility	20 g
3/31/86	WLSSD	Duluth/Endion	Wastewater	Pump Failure	1.5 mg

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
3/31/86	WLSSD	Hermantown	Wastewater	Snowmelt Runoff	1.8 mg
3/28/86	McKevitt Trucking	Carlton	Diesel	Assoc. w/ Truck	*
3/10/86	WLSSD	Duluth	Wastewater	Overflow	200 g
3/07/86	ICO	Gilbert	Fuel Oil	Leak	*
3/07/86	ICO	Gilbert	Fuel Oil	Leak	*
2/07/86	PM Company	Hibbing	Fuel Oil #1 & #2	Line Problems	*
1/09/86	United Power Assoc.	Two Harbors	Mineral Oil	*	34 g
1/09/86	United Power Assoc.	Two Harbors	Mineral Oil	Transformer	34 g
1/08/86	Petro Supply	Hibbing	Fuel Oil	Assoc. w/ Truck	2 g
11/30/85	WLSSD	Duluth	Wastewater	Overflow	45000 g
10/23/85	Spur Station	Eveleth	Gasoline	Overfill	20 g
10/22/85	Spur Station	Eveleth	Gasoline	Overfill	20 g
10/14/85	Frank’s 66	Duluth	Gasoline	UST	*
10/14/85	Walt’s Union 76	Virginia	Gasoline	UST	*
10/14/85	DM&IRR	Duluth	Hydraulic Oil	Hose Leak	30 g
9/16/85	MP&L	Aurora	Coal Pond Water	*	*
9/13/85	Taconite Oil	Virginia	Lube Oil	Fire	*
9/11/85	Taconite Oil	Virginia	Lube Oil	Fire	*

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
9/03/85	WLSSD	Esko	Wastewater	Power Failure	30 mg
8/30/85	WLSSD	Duluth	Sewage	Plugged Manhole	420000 g
8/30/85	Zenith Terrace Mobile Home	Duluth	Fuel Oil	Spilled in Sewer	100 g
8/06/85	US Steel Corp.	Mt. Iron	PCB Oils	Transformer Spills	10 g
7/19/85	*	Duluth	Drain Oil	Barrel	50 g
6/27/85	Hanna Mining	Keewatin	Mineral Oil	Transformer	185 g
6/25/85	Ordean Junior High School	Duluth	PCB Oils	Transformer	*
6/18/85	Safety Kleen	Cloquet	Solvent	*	*
6/12/85	Doug Hoffbaur	Hermantown	Lasso	Sprayer	25 g
6/10/85	Hanna Mining	Keewatin	Lube Oil	Broken Line	700 g
5/21/85	City of Proctor	Proctor	Gasoline	Truck Tank	40 g
5/14/85	MP&L	Duluth	Oil	Blowout	25 g
5/10/85	Lakeland Oil Co.	Cloquet	Gasoline	UST	*
5/07/85	Potlatch	Cloquet	Hydraulic Oil	Hose	50 g
5/06/85	Mational Steel Pelley Co.	Keewatin	Mineral Oil	Transformer	100 g
4/24/85	Potlatch	Cloquet	Mineral Oil	Transformer	1 g
4/18/85	US Coast Guard	Duluth	Diesel	Pump Failed	15 g
4/18/85	Como Oil Co.	Duluth	Fuel Oil	Overfill	5 g

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
4/18/85	Potlatch	Cloquet	PCB	*	1 qt
4/10/85	Ania Gift Shop	Duluth	Gasoline	UST	*
4/04/85	*	Mt. Iron	Gasoline	UST	*
3/25/85	Willers Truck Service	Twig	Diesel	Truck	60 g
3/18/85	Conoco	Wrenshall	Gasoline	Pump Gasket	44 bl
3/18/85	Edwards Oil	Hibbing	Gasoline	AST	63 g
3/06/85	Curtis Oil Co.	Duluth	Diesel	Overfill	50 g
2/28/85	Park Construction	Duluth	Motor Oil	*	*
2/27/85	Transport Inc.	Mt. Iron	Gasoline	Overfill	600 g
2/27/85	Potlatch	Cloquet	Gasoline	Line	20 g
2/15/85	Lakehead Oil Co.	Duluth	Fuel Oil	Overfill	*
1/25/85	Conoco	Wrenshall	JP4	Filter Leak	409 bl
1/11/85	Inland Steel Mining Co.	Virginia	Mineral Oil	Transformer	*
11/29/84	*	Duluth	Paint Stripper	*	*
11/29/84	*	Duluth	Gasoline	Spill	*
11/29/84	Virginia Public Utility	Eveleth	Mineral Oil	Truck	1 g
11/29/84	PRVI-FEBRUARY	Duluth	Oil	Ship	*
11/29/84	Air National Guard	Duluth	Jet Fuel	Spill	*

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
11/28/84	WM Pipeline	Duluth	Gasoline	*	*
11/27/84	Vintage Acres Mobile Homes	Duluth	Fuel Oil	Line	*
11/19/84	WLSSD	Duluth	Sewage	Bypass	1,500,000 g
11/15/84	WLSSD	Duluth	Wastewater	Heavy Rain	45,000 g
11/15/84	Potlatch	Cloquet	Soap Wood Slurry	Overflow	20,000 g
11/15/84	Superwood	Duluth	Molasses	Dike Vakve	6000 lbs
11/06/84	Mobil One Stop	Cloquet	Fuel Oil	Overfill	50 g
10/30/84	Indianhead	Twig	Fuel Oil	Truck Accident	*
10/26/84	Erickson Petroleum	Hibbing	Gasoline	*	*
10/24/84	US Steel Corp.	Mt. Iron	Mineral Oil	Transformer	40 g
10/07/84	*	Cloquet	Diesel	Truck	100 g
9/26/84	Hibbing Taconite	Hibbing	Diesel	Overfill	500 g
9/13/84	Potlatch	Cloquet	Hydraulic Oil	*	*
9/07/84	Hanna Mining	Nashwauk	PCB	Transformer	*
8/24/84	MN Power	Fond du Lac	Oil	*	1 g
8/15/84	Holiday Transport	Virginia	Gasoline	Truck	*
8/07/84	Potlatch	Cloquet	Effluent	*	*
7/30/84	Standard Brick & Supply	Duluth	Asphalt	Overfill	560 g

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
7/25/84	MN Power	Duluth	Mineral Oil	Transformer	*
7/12/84	Great Lakes Towing Co.	Duluth	Oil	Barge	*
6/28/84	ICO	Gilbert	Gasohol	Overfill	*
6/14/84	Potlatch	Cloquet	Wax Emulsion	*	500 g
6/10/84	WLSSD	Duluth/52 A E	Sewage	Heavy Rain	10,000 g
6/10/84	WLSSD	Duluth/77th A W	Sewage	Heavy Rain	*
6/10/84	WLSSD	Proctor	Sewage	Heavy Rain	*
6/10/84	WLSSD	Duluth	Sewage	Heavy Rain	*
12/25/83	WLSSD	Cloquet	Wastewater	Line Clogged	*
12/16/83	WLSSD	Duluth	Sewage	Backline Break	750,000 g
11/20/83	WLSSD	Proctor	Wastewater	Line Failure	71,000 g
11/20/83	WLSSD	Duluth	Sewage	Line Clogged	337,000 g
11/08/83	WLSSD	Duluth/Endion	Wastewater	Construction	80,000 g
10/28/83	WLSSD	Duluth	Ethylene glycol	Spill	100 g
8/30/83	WLSSD	Duluth/Endion	Wastewater	Power Failure	235,000 g
6/02/83	WLSSD	Duluth/52 A E	Sewage	Planning Error	5000 g
12/28/82	WLSSD	Duluth Plant	Liquor Foam	Human Error	2500 g
12/26/82	WLSSD	Scanlon	Sewage/Wastewater	Line Repair	6,000,000 g

Appendix J cont. Documented Spills in Minnesota

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
12/13/82	WLSSD	Proctor	Wastewater	Line Clogged	36,000 g
11/22/82	WLSSD	Carlton	Wastewater	Power Failure	69,000 g
3/05/82	WLSSD	Duluth/11th A W	Wastewater	Line Repaired	98,000 g
3/04/82	WLSSD	Duluth Plant	Calcium Hydroxide	Transfer	3500 g
6/16/81	WLSSD	Duluth/Endion	Sewage/Wastewater	Demonstration	300,000 g
3/03/81	WLSSD	Scanlon	Sewage/Wastewater	Main Break	180,000 g
3/03/81	WLSSD	Cloquet	Sewage/Wastewater	Main Break	22,500,000 g
3/03/81	WLSSD	Esko	Sewage/Wastewater	Main Break	100,000 g
1/30/81	WLSSD	Duluth/Endion	Sewage	Televising	50,000 g
1/19/81	WLSSD	Proctor	Wastewater	Line Break	300,000 g
12/02/80	WLSSD	Esko	Sewage/Wastewater	Line Repaired	180,000 g
12/02/80	WLSSD	Scanlon	Sewage/Wastewater	Line Repaired	300,000 g
12/02/80	WLSSD	Cloquet	Sewage/Wastewater	Line Repaired	30,000,000 g
11/24/80	WLSSD	Scanlon	Sewage/Wastewater	Electric Failure	250,000 g
5/15/80	WLSSD	Cloquet	Sewage/Wastewater	Crane Crash	767,000 g

KEY: g = Gallon
mg = Million Gallons
qt = Quart
bl = Barrel

tsp = Teaspoon
yds = Yards
lbs = Pounds
jp = Jet Petroleum/Fuel
UST = Underground Storage Tank
AST = Above Ground Storage Tank
* = Information Not Available

Appendix J

Part B

Compilation of Documented Spills and/or Accidental Releases
into the St. Louis River Drainage Basin
for the State of Wisconsin

Appendix J. Documented Spills in Wisconsin

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
1/09/91	Murphy Oil	Superior	Gas Additive	Valve Failure	25 g
1/08/91	Rod McKenzie	Superior	Fuel Oil #1	Tank Failure	140 g
1/03/91	Murphy Oil	Superior	Fuel Oil #1	Line Punctured	1550 g
12/20/90	J. R. Jensen	Superior	Fuel Oil	UST	*
12/12/90	Superior Senior High School	Superior	Fuel Oil	Tank Overflow	25 g
11/14/90	Murphy Oil	Superior	Sulfur	Overloaded Car	500 g
10/25/90	Carlson Fuels	Superior	Diesel	UST	*
10/24/90	Burlington Northern RR	Superior	Motor Oil	Drain Tile Leak	200 g
10/01/90	Cronstrom Rentals	Superior	Gasoline	UST	*
9/14/90	Murphy Oil	Superior	Gasoline	Tank Leak	800 g
8/24/90	*	Superior	Mineral Oil/PCB	Dumping	5 g
7/24/90	Murphy Oil	Superior	Fuel Oil #5	Leaking Line	25 g
7/18/90	United Purification	Superior	Used Oil	Overflow	100 g
7/14/90	Murphy Oil	Superior	Fuel Oil #6	Line Failure	850 g
7/14/90	Murphy Oil	Superior	Crude Oil	Valve Opened	4500 g
6/27/90	Unocal Corporation	Superior	Sludge/Gasoline	UST	100000 g
6/20/90	Barko Hydraulics	Superior	Gear Lube	Barrel Crushed	55 g
6/18/90	Koppers Industries	Superior	Creosote	Leaking Tank	20 g

Appendix J cont. Documented Spills in Wisconsin

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
6/11/90	Indianhead Truck Lines	Superior	Gasoline	Overfill	115 g
5/24/90	Murphy Oil	Superior	Fuel Oil #2	Gauge Failure	50 g
5/04/90	Highgate Court	Superior	Fuel Oil	UST	*
4/20/90	Lakehead	Superior	Diesel	UST	*
4/18/90	Murphy Oil	Superior	Fuel Oil #1	Leak in Pipe	250 g
4/17/90	Murphy Oil	Superior	Asphalt	Bad Valve	6500 g
3/29/90	Murphy Oil	Superior	Gas/Oil	Leaking Tank	300 g
3/25/90	Murphy Oil	Superior	Crude Oil	Valve Froze	100 g
3/15/90	Koppers Industries	Superior	Creosote	Leaking Tank	40 g
3/16/90	Soo Line RR	Superior	Diesel	Leaking Valve	400 g
3/09/90	Koppers Industries	Superior	Mineral Oil	Transformer	1 g
3/08/90	Murphy Oil	Superior	Waste Oil	UST	*
12/15/89	Peavy Globe Elevator	Superior	Fuel Oil	UST	*
12/15/89	Hammond Presbyterian Church	Superior	Fuel Oil #2&6	UST	*
12/15/89	Murphy Oil	Superior	Fuel Oil #2	Valve Opened	625 g
11/08/89	Amoco Oil	Superior	Waste Oil	UST	*
11/05/89	Burlington Northern RR	Superior	Benzene & Toluene	Valve Leaked	28000 g
11/11/89	United Purification	Superior	Petroleum	UST	*

Appendix J cont. Documented Spills in Wisconsin

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
11/01/89	Figgens Transport LTD	Superior	Fuel Oil	Truck Accident	200 g
10/26/89	Koppers Industries	Superior	Creosote/Petrol	Tank Overflow	2.5 g
10/20/89	Superior Water, Light & Power	Superior	Gasoline	Line Punctured	5 g
10/14/89	Murphy Oil	Superior	Asphalt	Tank Overfill	500 g
10/05/89	*	Superior	Fuel Oil	Tank Overfill	*
9/28/89	Murphy Oil	Superior	Crude Oil	Valve Open	500 g
9/08/89	Chicago North Western RR	Superior	Soda Ash	Spill	500 g
9/03/89	Murphy Oil	Superior	Asphalt	Transfer Spill	840 g
8/25/89	Murphy Oil	Superior	Fuel Oil #3	Tank Overfill	80 g
8/21/89	Seven Eleven Broadway	Superior	Gasoline	UST	*
8/18/89	Murphy Oil	Superior	Asphalt	Tank Gauge Fail	20 g
8/10/89	Murphy Oil	Superior	Gasoline	Tank Leak	150 g
8/02/89	Murphy Oil	Superior	Fuel Oil #1	Tank Overfill	200 g
7/28/89	Murphy Oil	Superior	Crude Oil	Open Valve	500 g
7/25/89	Garon Knitting Mills	Superior	Diesel	UST	*
7/25/89	Milkhouse Convenience Store	Superior	Gasoline	UST	*
6/20/89	Murphy Oil	Superior	Waste Oil	Leaky Seal	80 g
6/09/89	ABC Rail Corporation	Superior	Gasoline	UST	*

Appendix J cont. Documented Spills in Wisconsin

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
5/11/89	Amoco Oil Terminal	Superior	Fuel Oil	Separator Tank	*
5/02/89	Hardees	Superior	Gasoline	UST	*
1/21/89	Murphy Oil	Superior	Fuel Oil #2	Bad Gauge	4000 g
1/7/89	Murphy Oil	Superior	Gasoline	Valve Malfunction	150 g
12/19/88	Murphy Oil	Superior	Fuel Oil #2	Frozen Valve	200 g
11/8/88	Murphy Oil	Superior	Fuel OIl #6	Overfilled	84 g
10/28/88	Quickie Transport	Superior	Fuel Oil	UST	12500 g
10/27/88	Jacobson Trucking	Superior	Asphalt	Valve Cracked	3000 g
10/24/88	Corbin Bar	Superior	Fuel Oil #1	Tank Leak	15 g
9/28/88	Murphy Oil	Superior	Crude Oil	Open Tank	151200 g
8/15/88	Murphy Oil	Superior	Naptha	Open Valve	280 g
8/10/88	Murphy Oil	Superior	Asphalt	Loading Spill	50 g
7/8/88	Murphy Oil	Superior	Crude Oil	Gasket Blew	210 g
6/09/88	Koppers Industries	Superior	Creosote/Oil	Valve Leak	1500 g
6/01/88	Koppers Industries	Superior	Creosote	Leaking Hose	100 g
5/27/88	Murphy Oil	Superior	Liquid Asphalt	Leaking Tank	4500 g
5/22/88	Halvor Lines	Superior	Fuel Oil #2	Truck Accident	50 g
5/21/88	Halvor Lines	Superior	Fuel Oil #2	Truck Accident	20 g

Appendix J cont. Documented Spills in Wisconsin

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
5/18/88	Murphy Oil	Superior	Fuel Oil #1	Leak in Pipe	190 g
5/01/88	Murphy Oil	Superior	Liquid Asphalt	UST	4500 g
2/15/88	*	Superior	PCB Oil	Transformer	30 g
1/28/88	Unocal Corporation	Superior	Fuel Oil/Gasoline	UST	*
1/11/88	Lakehead Pipeline	Superior	Crude Oil	Valve Failed	175 barrels
1/05/88	*	Superior	Fuel Oil #2	Dumping	500 g
1/04/88	O'Brien Oil Co.	Superior	Fuel Oil #2	Truck Accident	400 g
9/16/87	*	Superior	Pesticide	Dumping	200 g
5/12/87	Murphy Oil	Superior	Tar	Bad Gauge	Unknown
5/12/87	Murphy Oil	Superior	Petroleum product	Bad Gauge	210 g
4/25/87	Murphy Oil	Superior	Asphalt	Open Valve	3150 g
4/25/87	Murphy Oil	Superior	Tar	Open Valve	3780 g
1/7/87	Murphy Oil	Superior	Fuel Oil	Leak in Pipe	8000 g
6/14/86	Murphy Oil	Superior	Unknown	Auto Gauge Off	100 g
3/21/86	Murphy Oil	Superior	Asphalt	Overfilled Tank	300 g
2/5/86	Murphy Oil	Superior	Asphalt	Faulty Gauge	>840 g
11/14/85	Murphy Oil	Superior	Fuel Oil #1	Leaking Line	100 g
6/27/85	Soo Line RR	Superior	Fuel Oil #2	Tank Ruptured	1000 g

Appendix J cont. Documented Spills in Wisconsin

DATE	RESPONSIBLE PARTY	LOCATION	SPILL	CAUSE	AMOUNT
3/21/85	Murphy Oil	Superior	Fuel Oil	Leaking Tank	250 g
4/24/84	Boswell's Spur	Superior	Gasoline	Leaking Tank	300 g
10/07/83	Maple Services	Superior	Fuel Oil #2	Hose Ruptured	75 g
11/01/82	Chicago & NWRR	Superior	Fuel Oil #2	Overfill	500 g
7/03/82	Soo Line RR	Superior	Fuel Oil #2	Tank Ruptured	3000 g
10/08/81	*	Superior	Fuel Oil #1	Tank Ruptured	150 g

APPENDIX K

Estimated 1989 Toxic Air Emissions Reported Under SARA 313
for Facilities within the St. Louis River Watershed

Appendix K. Estimated 1989 Toxic Air Emissions Reported Under SARA 313 for Facilities within the St. Louis River Watershed

FACILITY, LOCATION	SUBSTANCE	FUGITIVE AIR (POUNDS)	STACK AIR (POUNDS)
ABC RAIL CORPORATION SUPERIOR, WI	MANGANESE	250	250
BRANCOR VIRGINIA, MN	FORMALDEHYDE	-	250
	PHENOL	-	250
D.B. WESTERN VIRGINIA, MN	FORMALDEHYDE	250	250
DULUTH BRASS & ALUMINUM DULUTH, MN	COPPER & COMPOUNDS	250	750
HAARMAN & REIMER CORP. DULUTH, MN	MALEIC ANHYDRIDE		3
KOPPERS COMPANY, INC. SUPERIOR, WI	ANTHRACENE	17	19
	DIBENZOFURAN	29	43
	NAPHTHALENE	278	333
M.E. INTERNATIONAL DULUTH, MN	ALUMINUM OXIDE (FIBROUS)	1040	250
	CHROMIUM & COMPOUNDS	250	250
	MANGANESE & COMPOUNDS	250	250
	1,1,1-TRICHLOROETHANE	96200	-
MURPHY OIL USA, INC. SUPERIOR, WI	ALUMINUM OXIDE	-	37421
	BENZENE	2568	1193
	CUMENE	-	250
	CYCLOHEXANE	2087	402

Appendix K cont. Estimated 1989 Toxic Air Emissions Reported Under SARA 313 for Facilities within the St. Louis River Watershed

FACILITY, LOCATION	SUBSTANCE	FUGITIVE AIR (POUNDS)	STACK AIR (POUNDS)
MURPHY OIL USA, INC. continued	ETHYL BENZENE	1691	7830
	ETHYLENE	2483	1176
	NAPTHALENE	-	211
	PROPYLENE	12563	2288
	TOLUENE	7550	20336
	XYLENES (MIXED ISOMERS)	5468	53003
	1,2,4-TRIMETHYLBENZENE	-	2974
NORTH STAR STEEL MINNESOTA DULUTH, MN	CHROMIUM & COMPOUNDS	250	-
POTLATCH CORPORATION CLOQUET, MN	AMMONIA	21000	-
	CHLORINE DIOXIDE	250	19000
	HYDROCHLORIC ACID	-	180000
	METHANOL	20000	130000
	SULFURIC ACID	-	19000
SUPERIOR FIBER PRODUCTS SUPERIOR, WI	XYLENE	-	59295

Source: MN Dept. of Public Safety, 1990
WI DNR, 1990