CITY OF DULUTH, MINNESOTA

SOURCE WATER ASSESSMENT

June 2002

Public Water Supplier ID 1690011

Facility Contact:

Mr. Loren Janson
Department of Water and Gas
Lakewood Treatment Plant
8130 Congdon Boulevard
Duluth, Minnesota 55804
Telephone Number: (218) 525-0834

Minnesota Department of Health Contact:

Ms. Beth Kluthe
Minnesota Department of Health
1819 Bemidji Avenue
Bemidji, Minnesota 56601
Telephone Number: (218) 755-4173
Email: beth.kluthe@health.state.mn.us

PART I

INTRODUCTION

The 1996 Amendments to the federal Safe Drinking Water Act (SDWA) require the Minnesota Department of Health (MDH) to complete source water assessments for public water systems.

The requirements of the SDWA addressed herein are intended to provide Duluth drinking water customers with 1) a general description of the area which supplies water to the Duluth water utility; 2) an overview of why this water supply is susceptible to potential contaminants; 3) a description of the contaminants of concern which may impact water quality; and 4) to the extent practical, the origins of these contaminants.

The MDH, with the assistance of the Duluth water utility, assembled a source water assessment team to develop this source water assessment. This team included representatives from the Duluth water utility, St. Louis County, city of Duluth, Minnesota Pollution Control Agency, Minnesota Board of Water and Soil Resources, and University of Minnesota's Water Resources Center/Sea Grant.

STATUS OF SOURCE WATER PROTECTION

Although not a requirement of the SDWA, the city of Duluth may use this source water assessment as a basis and the framework for the development and implementation of a source water protection plan.

DESCRIPTION OF THE SOURCE WATER

The city of Duluth obtains its public water supply from Lake Superior, with a water treatment facility located near the intake. The water intake extends approximately 1,560 feet into the lake and terminates at a depth of approximately 72 feet. The water treatment plant has a pumping capacity of 34 million gallons per day. Average demand is approximately 22 million gallons per day.

The Lake Superior drainage basin covers approximately 49,300 square miles, and the Minnesota portion of the basin encompasses approximately 6,200 square miles. The lake itself covers approximately 31,700 square miles and contains approximately 2,900 cubic miles of water—approximately 10 percent of the world's fresh water.

SOURCE WATER SENSITIVITY

In determining the sensitivity of a source water, the intrinsic physical properties of the geologic setting or landscape within the watershed must be considered. The large quantities of water in Lake Superior, and the movement and mixing of water in the lake, help attenuate contaminant concentrations. The near-shore currents in the western arm of Lake Superior generally move in a counter-clockwise direction, although winds and storms influence this movement. Other factors influencing the sensitivity of a surface-water body include topography, hydrology, geology, vegetation, and the distribution of various soil types within the subwatersheds of the Lake Superior Basin. The closer the source of contamination is to the intake the greater the potential impact on the quality of the water used by the residents of Duluth. The further the source is from the intake the more likely contaminants released will be attenuated through dilution and lake water movement.

SOURCE WATER ASSESSMENT AREA

The source water assessment area for the city of Duluth includes three distinct nested areas. The inner emergency response area is designed to help the city address contaminant releases which present an immediate (acute) health concern to water users. This geographic area is defined by the amount of notification time the city needs to close the surface intake and a "buffer time" to accommodate unanticipated delays in notification and shut down. The outer source water management area is designed to enable protection of water users from long-term (chronic) health effects related to low levels of chemical contamination or the periodic presence of contaminants at low levels in the surface water used by the city. This area is intended to enable protection of users from contaminants that may 1) be usually present at treatable levels in the source water and 2) occasionally present an acute health concern under certain conditions, such as periods of high runoff or storm events. The establishment of this area also recognizes the potential for future land-use development that may influence source water. The third assessment area is the entire Lake Superior watershed in Minnesota. This area is designated to provide the water supplier with a broad perspective in which to prioritize specific types of land uses that may impact the water quality of the source water used. U.S. Environmental Protection Agency guidelines suggest including the entire watershed up to the state boundaries as part of the source water assessment area. Altogether, these three areas are collectively labeled the "source water assessment area."

The inner emergency response area for Duluth is shown in Figure 1. The initial source water assessment area for Duluth was a circular "critical assessment zone" that was based on the U.S. Environmental Protection Agency "Great Lakes Protocol." The size of the critical assessment zone is determined by the length and depth of the water intake pipe. For Duluth, the radius of the critical assessment zone is 2,000 feet, centered on the terminus of the water intake pipe in Lake Superior. This zone was modified by the Duluth source water assessment team, based on local conditions, potential contaminant sources, and water supply concerns. The assessment team's work resulted in the establishment of the "inner emergency response area," which encompasses and expands the initial "critical assessment zone." The boundary of the inner emergency response area starts at a point 2,000 feet lakeward from the water intake, extending to the northeast and southwest to include the drainages of the four small streams discharging into Lake Superior, and extending inland to a point 500 feet inland from the expressway. This area includes the expressway, Highway 61, and the railroad tracks.

Figure 1 also shows the outer source water management area for Duluth. This area is bounded by and includes the Knife River watershed to the northeast of the inner emergency response area, extends west and southwest into the city of Duluth, and includes the southern portions of the "South Lake Superior" Watershed. The Minnesota portion of the Lake Superior basin, an area of approximately 6,200 square miles, is shown in Figure 1 as well. It includes all of the Lake Superior shoreline in Minnesota as well as the inner emergency response areas and outer source water management areas for other public water suppliers.

PART II

POTENTIAL CONTAMINANTS OF CONCERN

The contaminants of concern are those regulated under the federal SDWA and listed in the National Primary Drinking Water Standards. They are divided into organic chemicals, inorganic chemicals, radionuclides, disinfection byproducts, and microorganisms. A listing can be found at: *http://www.epa.gov/safewater*.

SOURCES OF CONTAMINANTS

Both point sources (such as industrial and wastewater treatment plant discharges) and nonpoint sources (such as runoff from residential and urban areas) are present in the source water assessment area for the city of Duluth. Specific concerns relative to the Duluth water supply are: 1) the potential for spills from ships, truck transport on the expressway, Highway 61, and the railroad; 2) turbidity from stream bank erosion and storms; 3) leaking septic tanks and the possible extended sewer line; 4) pollutant discharges and surface runoff from the city of Duluth; 5) discharges from the rivers that flow into Lake Superior; 6) the possible McQuade Road Marina; and 7) possible new development in the area surrounding the water treatment plant.

To the extent practical, Table 1 contains a listing of potential point sources of contamination located in the inner emergency response area and outer source water management area. The potential sources of contamination listed in the table represent data collected from a number of state and federal databases. Due to the number of data sets involved in preparing this table, some duplication is possible. Many of the data files do not contain accurate locational information for potential contaminant sources. Editing the data sets for possible duplication and locational accuracy was not possible to perform as part of the preparation of this source water assessment.

TABLE 1
INVENTORY OF POTENTIAL CONTAMINANT SOURCES

DESCRIPTION	TOTAL
Agricultural Chemical Storage Site	20
Agricultural Feed Storage Site	3
Agricultural Seed Storage Site	1
Agricultural Site Unspecified	38
Air Release Site	21
Airport	1
Cemetery	10
Dam	1
Dump	6

DESCRIPTION	TOTAL
Golf Course	1
Hazardous Waste Generator	1
Heliport	2
Leaking Underground Storage Tank Site	310
National Pollution Discharge Elimination System Site	14
No Further Remediation Planned Site	5
Permanent List of Priorities Site	1
Pipeline Facility	1
Registered Storage Tank	299
Resource Management Plan Site	1
Seaplane Landing Area	1
Voluntary Investigative Clean-up Site	16
Toxic Release Inventory Site	1

The Lake Superior basin in Minnesota includes the Lake Superior shoreline, North Shore tributary streams, and St. Louis and Nemadji River systems. Carlton, Cook, Lake, and St. Louis Counties make up the major Minnesota portion of the Lake Superior basin—the basin also includes small areas of Aitkin, Itasca, and Pine Counties. Land cover within the four major counties of the basin is primarily forested (84 percent of the land area). Logging activities are potential sources of non-point pollution in the basin. A portion of the Mesabi Iron Range is located within the basin. Although mining occupies a small portion of the land area within the basin, mining activities represent potential sources of point and non-point contaminants. Population centers within the Lake Superior basin are concentrated in Duluth, Mesabi Iron Range, and several North Shore communities. Potential contaminant sources from urban centers include surface runoff, stormwater and sanitary sewer discharges, leaking septic systems, and various point source discharges.

The former Reserve Mining Company's taconite tailings delta in Lake Superior near Silver Bay contains mineral fibers, which prompted the addition of water filtration by community water suppliers along the North Shore of Lake Superior.

Transportation accidents that spill contaminants into Lake Superior are a concern. U.S. Highway 61 is a major transportation corridor along the entire Minnesota portion of the North Shore of Lake Superior. Also, commercial shipping uses the ports of Duluth and Superior, Wisconsin.

Table 2 contains a description of land uses within the inner emergency response area and outer source water management area for Duluth.

TABLE 2
LAND USES WITHIN THE DULUTH INNER EMERGENCY RESPONSE AREA AND OUTER SOURCE WATER MANAGEMENT AREA

DESCRIPTION	ACRES
Open Water	2941
Low Intensity Residential	4481
High Intensity Residential	2215
Commercial/Industrial/Transportation	2602
Quarries/Strip Mines/Gravel Pits	69
Barren Transitional	77
Deciduous Forrest	42262
Evergreen Forest	8817
Mixed Forest	17210
Grasslands/Herbaceous	219
Pasture/Hay	4647
Row Crops	4111
Urban/Recreational Grasses	1293
Woody Wetlands	16034
Emergent Herbaceous Wetlands	218
Bare Rock/Sand/Clay	149

RESULTS OF MONITORING THE SOURCE WATER

Source water monitoring results can be found in the various programs conducted in the Lake Superior Basin. The following websites provide access to information produced by various monitoring programs on Lake Superior:

Minnesota Pollution Control Agency: *http://www.mpca.state.mn.us*
U.S. Environmental Protection Agency: *http://www.epa.gov/storet*
Great Lakes Environmental Research Lab: *http://www.glerl.noaa.gov*

Other federal agencies collect and maintain Lake Superior data, including the Coast Guard, Army Corps of Engineers, National Park Service, and National Oceanic and Atmospheric Administration.

The Minnesota Pollution Control Agency's Lake Superior Basin Information Document contains a general description of water quality in Lake Superior. Since 1980, water quality throughout the basin has remained well above the state average; and levels of nitrogen, phosphorus, fecal coliform bacteria, and oxygen-depleting materials are below the state average. The lower reach of the St. Louis River near Duluth has been designated as an "area of concern" by the International Joint Commission due to the impairment of beneficial uses, including fish consumption, swimming, and aquatic communities.

Mercury, polychlorinated biphenyls (PCBs), and certain other toxic chemicals exist at levels that are unacceptably high in the fish, water, and sediment of Lake Superior. The U.S. Environmental Protection Agency has noted that 77-89 percent of the PCBs currently entering Lake Superior comes from atmospheric deposition. Toxic contaminants such as PCBs, mercury, and pesticides pose a significant threat to Lake Superior water quality because they remain in the water and sediment for such a long time, due both to their persistence and the 173-year flushing time for Lake Superior.

Despite its large size, Lake Superior is sensitive to the effects of many pollutants. Pollution sources include runoff of soils and farm chemicals from rural areas, wastewater discharges and urban runoff from cities, discharges from industrial areas, and leachate from disposal sites.

Lake Superior water clarity is very high; however, the water is usually more turbid at stream mouths. In addition, turbidity in Lake Superior increases in response to high rainfall events, spring runoff from snowmelt, and storms.

Most monitoring programs in or related to Lake Superior are conducted for purposes other than drinking water protection. A greater emphasis on drinking water standards in the future would be beneficial to public water suppliers. Results of the various monitoring programs have verified the presence of many potential contaminants in the source water, all of which have been adequately treated by the water treatment plant. The public water supplier also conducts a monitoring program for raw and finished water.

SUSCEPTIBILITY OF THE SOURCE WATER TO CONTAMINATION

Susceptibility is defined as the likelihood that a contaminant will enter a public water supply at a level which may result in an adverse human health impact. The determination of susceptibility by the U.S. Environmental Protection Agency is on a scale of low, medium, and high. The susceptibility of any surface-water source, such as Lake Superior, is determined to be high because there is no practical means of preventing all potential contaminant releases into surface waters. The federal SDWA recognizes the susceptibility of surface waters and requires filtration to remove pathogens and particulate contaminants. The susceptibility of the Duluth surface-water intake to contamination is classified as high.

While it has been determined that Duluth's source water is highly susceptible to contaminants found in the lake, historically the city's water plant has effectively treated this source water to meet safe drinking water standards. However, water suppliers are being increasingly challenged to comply with new and changing standards and to respond to changing land uses and conditions within the source water assessment areas.

USING THIS ASSESSMENT

Protecting the drinking water source is a wise and relatively inexpensive investment in Duluth's future. The overall intent of this assessment is to provide background information for the community to use in developing a source water protection plan. The assessment benefits the community by providing the following:

- ***A basis for focusing limited resources within Duluth to protect the drinking water source.***
  The source water assessment provides the community with information regarding activities within the source water assessment area that may directly affect its water supply.

- ***A basis for informed decision-making regarding land use within Duluth***.
  The assessment provides the community with information regarding the source of its drinking water and the contaminant threats to the quality of that source. Knowledge of the character and location of the resource allows planning authorities to make informed decisions regarding land uses within the source water assessment area that are compatible with protecting drinking water resources.

- ***A basis for informed source water planning efforts for the source water assessment area for Duluth.***
  The city of Duluth shares the use of Lake Superior with other communities located along the North Shore of Lake Superior. This assessment and those prepared for these other communities can be used to identify common issues and concerns regarding the protection of drinking water supplies. As such, assessment results can be used to bring communities together to begin the development and implementation of a basin-wide approach to implementing source water protection measures.

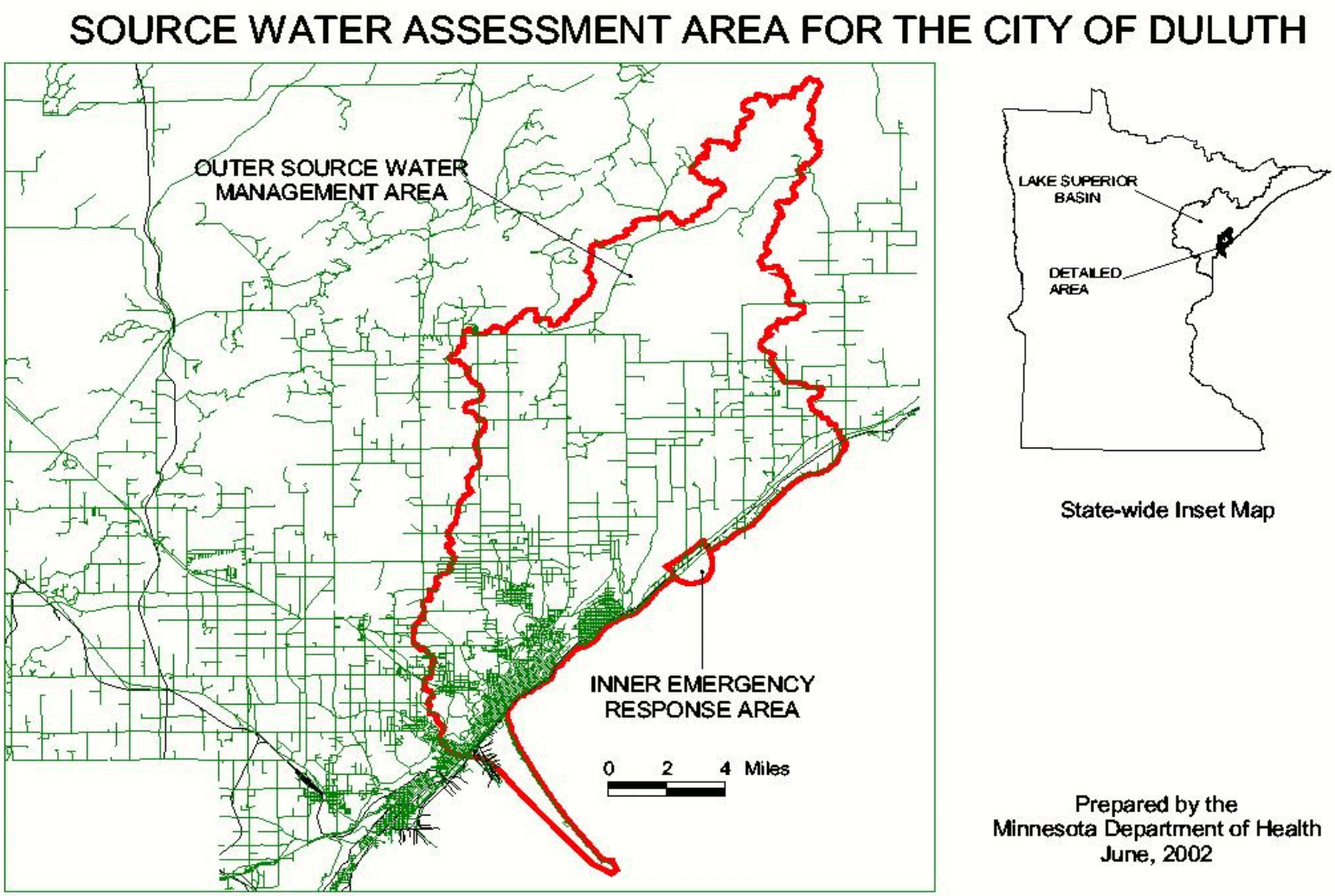

FIGURE 1
SOURCE WATER ASSESSMENT AREA FOR THE CITY OF DULUTH