

EXECUTIVE SUMMARY

The Watershed Characterization Report is a documentation of the water resources within the watershed for the Lakehead Source Protection Area, as defined under the “Clean Water Act, 2006”. The boundaries of the Lakehead Source Protection Area are determined by the scientific watershed area regulated under Ontario Regulation 284/07. The Characterization Report provides a description of the natural environment and the human influences that may impact water quality and quantity of the watershed as it relates to Source Protection Planning. The natural environment of a watershed consists of the geology, topography, hydrology, soil types and forest cover. Human influences that could impact the sources of water are population, population distribution, historical development, land use and industrial and commercial development. The report also identifies the stakeholders, such as provincial and federal government agencies, First Nations, industry, organizations, etc. who have an interest in the process for Source Protection Planning. The Watershed Characterization Report was prepared by the Lakehead Region Conservation Authority in close association with the member municipalities: the City of Thunder Bay; Municipalities of Oliver Paipoonge, Neebing and Shuniah; the Townships of O’Connor, Conmee, Gillies and Dorion; local provincial and federal government organizations, as well as interested and affected private groups and industry.

The physical features of the landscape have an influence on the sources and movement of water throughout a watershed. Geology, topography, soils and forest cover are key components taken into consideration to understand the distribution and movement of surface and ground water within the Lakehead Source Protection Area. The geology of the Lakehead Source Protection Area is the product of two widely separated geological eras. The Precambrian era took place between 600,000 and over 3.5 billion years ago. The Pleistocene period ended only 10,000 years ago. The Lakehead Source Protection Area is underlain by ancient Precambrian rocks of the Canadian Shield, which are comprised of assemblages of metavolcanic-metasedimentary rocks which have been intruded by rock of varied composition. Glacial activity, post glacial melt and river outwash has resulted in an extremely variable topography and thickness of soil and gravels deposition. In general the Lakehead Source Protection Area tends to have shallow overburden layers with only a few areas exceeding 25 metres. However, sand and gravel deposits are predominant throughout the area in moraines, eskers and drumlins formed from glacial activity. Agriculture land is not as predominant except in the river valleys of the Kaministiquia and Slate River and land around Dorion that have deeper soil deposits.

Woodlands contribute to improved water quality and quantity by decreasing the speed of overland water flow and erosion, increasing evapotranspiration and intercepting rainfall and increasing infiltration to shallow groundwater areas. The Lakehead Source Protection Area lies within two major forest regions, the Great Lakes–St. Lawrence Forest Region and the Boreal Forest Region. The boundary separating the two forest types runs in a northwest-southwest direction from north of Kashabowie Lake (the western edge of the Lakehead Source Protection Area) to the shore of Lake Superior in the Municipality of

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Shuniah. South of this line lies the Great Lakes–St. Lawrence Region, with the boreal forest lying to the north. Typical tree species of the Great Lakes – St. Lawrence Region include red and white pine, yellow and white birch and aspen species, although recent fires have brought balsam fir and white spruce into prominence as well. Dominant boreal forest species include white and black spruce, jack pine, white birch and balsam poplar. The majority of the Lakehead Source Protection Area is covered by forest with the exception of the settled areas and the agricultural lands.

Forest and vegetation cover for the area relates to climate, which is typical of a mid-latitude inland location with a moderating influence from the Great Lakes. The mean temperature difference between summer and winter is at least 30 degrees Celsius with average temperatures in January -18 degrees Celsius and July 18 degrees Celsius. This characteristically results in low precipitation in winter (mostly snow) with higher average rainfalls in the summer. Topography has a pronounced effect on the local weather systems as well as the influence from Lake Superior. The height of land, at the westerly and northerly boundaries of the Lakehead Source Protection Area, tends to deflect storm centres from these directions resulting in less intense areas of the storm passing over the settled areas closer to Lake Superior. The climate in the vicinity of the City of Thunder Bay is characterized by extremes in temperature, low humidity and moderate winds, characteristic of a mid-latitude inland location. The constant influence of several air masses, including moist subtropical air, dry arctic air and dry continental air masses, makes the area susceptible to extreme and rapid variations in the weather throughout the year. The influence of Lake Superior on the local climate is restricted to a zone approximately 16 kilometres inland from the shoreline with the prevailing winds in this area off shore (easterly). An occasional east to southeast breeze off Lake Superior will produce a low overcast cloud over the area but this layer rarely extends farther than 32 to 40 kilometres inland. This same off-lake circulation results in a few cases of snow flurries during the early winter but snowfall amounts from these are not as heavy or as frequent as in localities on the south shore of Lake Superior.

The total population of Lakehead Source Protection Area is around 125,000 resulting in a population density of 0.11 per hectare. The City of Thunder Bay is the major urban centre within the Lakehead Source Protection Area. Its population of approximately 110,000 comprises 90 per cent of the total population for the defined area for Source Protection under the “Clean Water Act”. The Municipality of Oliver Paipoonge (the only other Municipality in the Lakehead Source Protection Area with a Municipal residential drinking water system) is the next largest population at approximately 5,800.

Approximately 4.41 percent of the total land and water area in the Lakehead Source Protection Area (50,815 hectares) is designated as wetlands. Of the 50,815 hectares, 3,851 hectares are designated Provincially Significant Wetlands. There are 13 Provincially Significant Wetlands and 5 Locally Significant Wetlands within the Lakehead Source Protection Area.

The Lakehead Source Protection Area boundary was delineated by using the most current computer modeling methods and a Digital Elevation Model, defining the lay of the land

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and the assumed flow of water in relation to the topography. The Lakehead Source Protection Area drains to Lake Superior through the major tributaries, such as the Kaministiquia, Neebing, Current and McIntyre Rivers and McVicar Creek. The Kaministiquia River and its tributaries form the most significant drainage system in the Lakehead Source Protection Area. The Kaministiquia and its tributaries, the Slate and Whitefish Rivers drain a major portion of the area west of the City of Thunder Bay. These rivers flow into Lake Superior at the bay known as, Thunder Bay. The Dog River system feeds into Dog Lake which is the source of the Kaministiquia River. The Kashabowie, Matawin and Wiegant Rivers feed into the Shebandowan River which drains into the Kaministiquia River north of Kakabeka Falls. Other major water systems in the Lakehead Source Protection Area include; Cloud, Lomond, Pearl, Pigeon, Pine, McKenzie and Wolf Rivers and Pennock, Mosquito and Whiskeyjack Creeks. The lake known as Loch Lomond, located 287 meters above sea level, collects most of the runoff within the Nor'Wester Mountains which is in turn drained by the Lomond River. A few square miles of mountain slope south of Mount McKay are drained by Whiskeyjack Creek.

Areas of potential groundwater discharge occurring near the City of Thunder Bay include the Slate River valley and Kaministiquia River valley. Areas associated with sands and gravels are commonly discharge areas. Large bedrock valleys can influence the zones of groundwater flow concentrating the areas of groundwater discharge. Smaller areas of groundwater discharge occur along local topographic lows and associated stream valleys, providing baseflow to the numerous streams in the northern part of the Lakehead Source Protection Area. Most of the aquifers of importance to the Lakehead Source Protection Area are unconsolidated porous media such as sand and gravel. Unconfined aquifers are those that are bordered by the water table. Water table elevations range from 183 metres above sea level adjacent to Lake Superior to 640 metres above sea level in the western and northern part of the Lakehead Source Protection Area. Some aquifers however, lie beneath layers of impermeable materials.

In the Lakehead Source Protection Area, there are only two identified Municipal residential drinking water systems as defined in the "Clean Water Act". The Municipal systems service the City of Thunder Bay and Rosslyn Village in the Municipality of Oliver Paipoonge. The City of Thunder Bay obtains its Municipal residential drinking water from the Bare Point Water Treatment Plant. The treatment plant draws its water from a surface water intake from Lake Superior to serve about 100,000 of 109,104 residents. The intake pipe is located in Lake Superior approximately 750 metres off shore from the plant and 30 metres below the surface. The hamlet of Rosslyn Village located approximately 14 kilometres west of the City of Thunder Bay, in the Municipality of Oliver Paipoonge has a Municipal residential drinking water system that is a basal sand and gravel aquifer approximately five metres thick immediately above the bedrock, confined beneath approximately 35 metres of clay and silt rich material. Two wells were drilled in 1974 and currently water is pumped from the two wells on an alternating basis to a single water treatment plant.

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The remainder of the residents in the Lakehead Source Protection Area, including approximately eight percent of the population within the City of Thunder Bay obtain their drinking water from private wells.

There have been no significant water quantity or quality concerns for source water for municipal residential drinking water systems, in the recent past, within the Lakehead Source Protection Area. Within the Watershed Characterization Report, land use activities were identified and described, as they may have an impact or become potential threats to the source water. Transportation, economic and industrial development, forestry, mining, agriculture, power generation and recreation activities were all characterized with the potential threats to source water in mind. Other potential sources for contamination could include spills, fuel storage tanks, improperly constructed or abandoned wells, mining operations, chemical storage and use, landfills, road salt storage and application and potential non-point sources of contamination (pesticide applications, lawn care, organic soil conditioning sites/septage sites, dredging disposal and agricultural sites).

Maps were produced as per the Ontario Ministry of Environment (MOE) “Watershed Characterization Report Guidance Module”, in conjunction with the report to provide a visualization of the characteristics of Lakehead Source Protection Area. The maps provide an illustration of the characteristics of the watershed and support the data described in the text. The Maps can be located in Binder #2.

The Watershed Characterization Report was prepared as part of the Assessment Report for Drinking Water Source Protection. The Assessment Report will be the key document used to develop the Source Protection Plan for the Lakehead Source Protection Area. The Watershed Characterization Report will be used by the Lakehead Source Protection Committee to support the development of an Assessment Report and a Source Protection Plan for the Lakehead Source Protection Area. There were a number of data gaps identified in collecting information for the report and the maps associated with it. As Source Protection Planning progresses in the Lakehead Source Protection Area, more data may become available. New and updated information will either be annexed to the Watershed Characterization Report or become part of the Assessment Report.

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