



DATE: January 13, 2004

Memorandum

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FROM: L. H. Frost, M.Sc., P.Eng.
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**RE: TURTLE MOUNTAIN WATERSHED MANAGEMENT PLAN
GROUNDWATER RESOURCE INVENTORY**

As per the TAG meeting held in Deloraine on October 15, 2003, the Groundwater Management Section is pleased to provide the following groundwater related information for resource inventory in support of the preparation of a Watershed Management Plan for the Turtle Mountain Conservation District (TMCD).

STUDY AREA

The current TMCD boundary consists of the rural municipalities of Arthur, Brenda, Winchester, Morton and Turtle Mountain, in addition to the towns of Deloraine, Boissevain, Killarney and the Village of Waskada. Annual crop production is the dominant land use, with forage and livestock also playing an important role.

GROUNDWATER RESOURCES

Reference Material

Groundwater is an important source of water supply for rural, private domestic use as well as municipal, agricultural and industrial purposes within the TMCD. Groundwater resource information for areas of the TMCD is provided within the following reference material:

- Groundwater Resources in the Turtle Mountain Conservation District. Manitoba Department of Mines, Resources and Environmental Management. Planning Branch. Report No. 78/27. 1978.
- Groundwater Resources in the Turtle Mountain-Killarney Planning District (A Synopsis). Manitoba Department of Natural Resources. Water Resources Branch. Report No. 81/20. 1981.

- Turtle Mountain-Killarney Planning District Development Plan – Groundwater. Manitoba Department of Natural Resources. Water Resources Branch. 1981.
- Groundwater Resources in the Town of Deloraine (A Synopsis). Manitoba Department of Natural Resources. Water Resources Branch. Report No. 83/15. 1983.
- Groundwater Resources in the Del-Win Planning District (A Synopsis). Manitoba Natural Resources. Water Resources Branch. Report No. 86/3. 1986.
- Groundwater Availability Map Series, Virden Area (62-F), Manitoba Natural Resources, Water Resources, 1983.
- Aquifer Maps of Southern Manitoba, Map 1 of 2, Bedrock Aquifers, M. Rutulis, Department of Natural Resources, Water Resources Branch, 1986.
- Aquifer Maps of Southern Manitoba, Map 2 of 2, Sand and Gravel Aquifers, M. Rutulis, Department of Natural Resources, Water Resources Branch, 1986.
- GWDrill - a provincial data base containing geological, hydrogeological, geochemical and well construction information for test holes and water wells from well driller's reports. GWDrill is administered by the Groundwater Management Section of the Water Branch, Manitoba Water Stewardship.

Aquifer Information

Groundwater is available from a number of aquifers located throughout the area of the TMCD. The quantity and quality, however, varies considerably from location to location. Maps of the approximate boundaries of the sand and gravel and bedrock aquifers within the TMCD are presented on Drawings 1 and 2 respectively, and in general, are summarized below. GIS layers of the sand and gravel and bedrock aquifers are available from Manitoba Conservation's geospatial data library.

Sand and Gravel Aquifers

Thin Unconfined Sand: These aquifers are formed by generally thin surface sand deposits, and often are minimal in saturated thickness and areal extent. Well yields are often low and the supply not reliable, and typically range from about 1 to 50 Igpm. The chemical quality of groundwater for domestic use ranges from fair to excellent.

Lenses of Sand and Gravel: These aquifers occur in till and other surficial deposits, and vary considerably in thickness and areal extent. The depth of these aquifers range from a few metres to more than 100 metres. Well yields are low to moderate, and typically range from about 1 to 65 Igpm. The chemical quality of groundwater for domestic use ranges from very poor to excellent.

Major Buried Sand and Gravel: This aquifer is more or less continuous over the indicated area. The depth of the aquifer ranges from a few metres to more than 100 metres. Well yields typically

range from about 7 to 26 Igpm. High capacity wells may yield from 130 to more than 650 Igpm. The chemical quality of groundwater for domestic use ranges from poor to excellent.

Minor Sand and Gravel: These are areas with very few scattered minor sand and gravel aquifers. Typically bedrock is at or near ground surface or surficial deposits consist of mainly low permeability materials (e.g., clay and till). Often these areas are underlain by bedrock aquifers. Well yields and the chemical quality of groundwater is variable.

Bedrock Aquifers

Sandstone and Sand: These aquifers consist of sandstone and, more commonly, sand layers interbedded with clay, silt, shale and coal beds. The depth of the sandstone is generally less than 40 metres. Well yields are typically less than 13 Igpm but can exceed 100 Igpm at a few locations. The chemical quality of groundwater for domestic use ranges from poor to good.

Shale: These aquifers are formed in fractured shale beds of the Odanah Shale member. The depth of these aquifers typically range from about 10 to 40 metres. Well yields are typically low and yield less than 13 Igpm. The chemical quality of groundwater for domestic use ranges from very poor to good. As shown on Drawing 2, an extensive area of the shale contains slightly saline water with a total dissolved solids concentration typically in the range of 2,500 to 5,000 mg/L. The water is not potable, but may be acceptable for some livestock and other uses.

Provincial Observation Wells

The province currently maintains a network of 11 active observation wells within the TMCD as shown on Drawing 1. The observation wells are used to monitor groundwater levels and collect groundwater chemistry data from various sand and gravel aquifers located throughout the conservation district. A GIS layer of the provincial observation well locations is not yet available within Manitoba Conservation's geospatial data library.

Water Systems

The classification of water systems falls under The Drinking Water Safety Act (S.M. 2002, c. 26) which is administered by The Office of Drinking Water, Manitoba Water Stewardship. Under the Act, a water system is defined as a well, or a device or structure or an assemblage of devices and structures, used or intended to be used for the production, treatment, storage or delivery of potable water for domestic purposes.

There are three types of systems supplying water, namely:

- 1) private water system – a water system that supplies water only to one private residence, unless otherwise specified in the Act.
- 2) public water system – a water system that has 15 or more service connections, unless otherwise specified in the Act.

- 3) semi-public water system – a water system that is not a public water system or a private water system (e.g., schools, hospitals, personal care homes, hotels).

Well location, stratigraphic, well construction and well testing information for private, public and semi-public wells are available from the provincial GWDrill data base, providing the information has been forwarded to the Water Branch. In most cases, accurate UTM data is not available.

A GIS layer of the private, public or semi-public well locations is not available within Manitoba Water Stewardship's geospatial data library.

GROUND WATER AND WATER WELL ACT

The Ground Water and Water Well Act (Chapter G110) and Well Drilling Regulation (228/88R) is administered by the Water Branch of Manitoba Water Stewardship. The Act applies to all sources of groundwater and to all wells whether drilled or developed before or after the Act was established in 1963. With the exception of controlling the flow from wells and the prevention of polluting groundwater and wells, the Act does not apply to a well that is drilled or developed by an owner on his land, using equipment owned by him, for the purpose of obtaining water solely for his domestic use.

Specifically, the Act:

- licenses all persons engaged in the business of drilling water wells;
- allows access and inspection of all wells or operations, and to all records, plants or equipment;
- allows undertaking of surveys of groundwater resources and studies of the conservation, development and utilization of groundwater;
- allows control of flow from wells;
- requires all reasonable precautions be taken to prevent contamination of groundwater via wells; and
- allows establishment of regulations related to the conservation, development and control of groundwater resources and the drilling and operation of wells and the production of groundwater there from.

The Well Drilling Regulation provides regulation for:

- the terms of licensing;
- collecting well drilling and testing information, maintaining well logs and submitting well reports;

- construction requirements;
- control of flow (artesian conditions);
- prevention of contamination of wells and aquifers; and
- sealing of abandoned wells.

GROUNDWATER CONTAMINATION ISSUES

With respect to contamination of water wells or aquifers, any well or aquifer has the potential to become contaminated if measures are not taken to protect from or reduce the risk of contamination. In considering development plans within the watershed, the following comments are offered:

Groundwater Sensitive Areas

Groundwater sensitive areas are defined as those areas with the greatest risk for contamination of groundwater from sources at or near the surface regardless of how local or extensive the aquifer may be. The degree to which shallow aquifers will be vulnerable to contamination from the surface will largely depend upon the thickness and properties of the material overlying the aquifer and the properties of the pollutant. Aquifers that are overlain by six metres or more of low permeability material (such as clay or till) are considered as having low potential for contamination from surface activities. Aquifers consisting of sand and/or gravel or bedrock that are exposed at the surface are vulnerable to water degradation from surface activities. The degree of protection of the groundwater will increase with increasing cover of low permeability material.

Within the TMCD, existing map information and water well logs can be used as a reconnaissance siting tool in identifying groundwater sensitive areas. For any proposed site development in the watershed, site specific investigations should be considered. The degree of detail for the site specific investigations would depend on the proposed site use and potential for contamination of underlying soil and groundwater.

Water Well Construction

The responsibility lies with the owner of a water well to ensure that their well and water distribution system is properly constructed and maintained and that the well provides water that is safe for drinking. Unfortunately, past investigations conducted by Manitoba Conservation throughout regions of the Province indicate that a common cause of water well contamination is improperly constructed, maintained or protected wells. Property owners installing new water wells should ensure:

- an experienced and licensed well drilling contractor is retained for the drilling and construction of the water well;

- water wells are located at a safe distance from potential sources of contamination and in an area away from surface runoff from potential sources;
- an experienced and licensed contractor completes the hookup of the water well to the water distribution system (pitless well construction);
- after the water well has been completed but before it is put into operation, the well, pump and water distribution system are disinfected to kill any bacteria that may be present; and
- old wells are properly sealed to the standards recommended in Manitoba's Guide for Sealing Abandoned Water Wells.

Buyers of property containing an existing water well should retain a qualified professional to inspect both the water well and water distribution system to ensure they are properly constructed and in good working order and that the water is safe for drinking.

It is recommended that all water well owners monitor the quality of their water supplies and conduct proper well maintenance on a regular basis. The Province of Manitoba currently subsidizes 70 percent of the cost of drinking water bacterial tests for all drinking water systems.

Well head protection programs, at the private, municipal or watershed level, should also be considered to reduce the risk of contaminating well supplies.

Private Sewage Disposal Systems

Private sewage disposal systems are regulated by the Private Sewage Disposal Systems and Privies Regulation under The Environment Act. Municipalities within the TMCD should ensure the design and construction of private sewage disposal systems are suitable for the soil conditions encountered and lot size proposed for any development.

Livestock Operations

Livestock operations and manure spreading are regulated under the Livestock Manure and Mortalities Management Regulation under The Environment Act. As well, the Province has prepared Farm Practice Guidelines for Hog / Beef / Dairy / Poultry Producers in Manitoba and provides a Technical Review process for new and expanded operations. These processes have been developed to reduce the potential risk of groundwater contamination.

Sand and Gravel Pits

There are a number of active and inactive sand and gravel pits located throughout the TMCD. The establishment and operation of quarries are regulated by the Quarry Minerals Regulation under The Mines and Minerals Act. The regulation states that no operator shall contaminate groundwater, or permit the contamination of groundwater, through the establishment or operation of an aggregate quarry.

Other Considerations

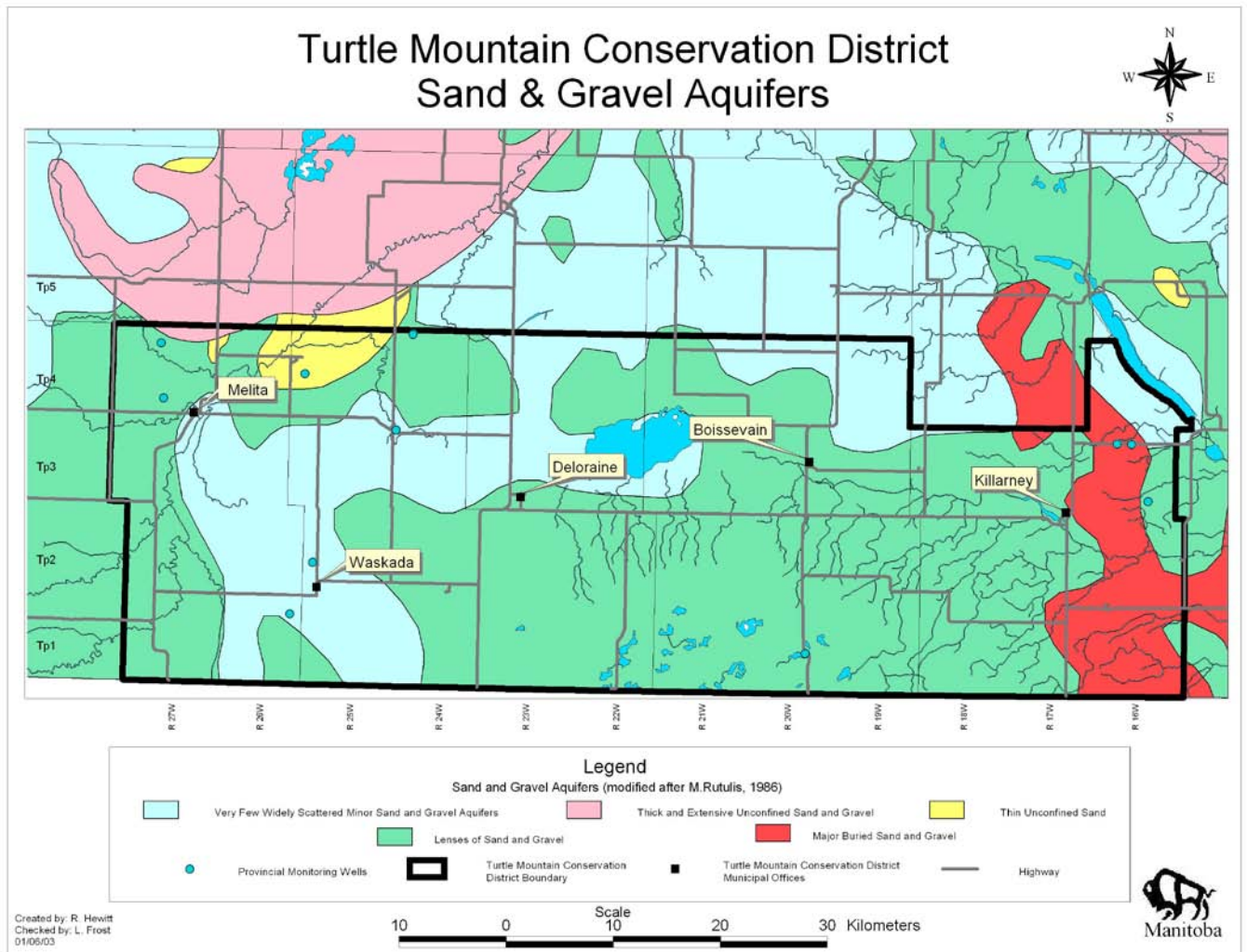
Other potential sources of contamination that may be considered include: municipal sewage systems, agricultural operations, industrial operations, pipelines, gas stations and transportation spills.

Should you have any questions or require further information, please contact the undersigned at 204-945-3737.

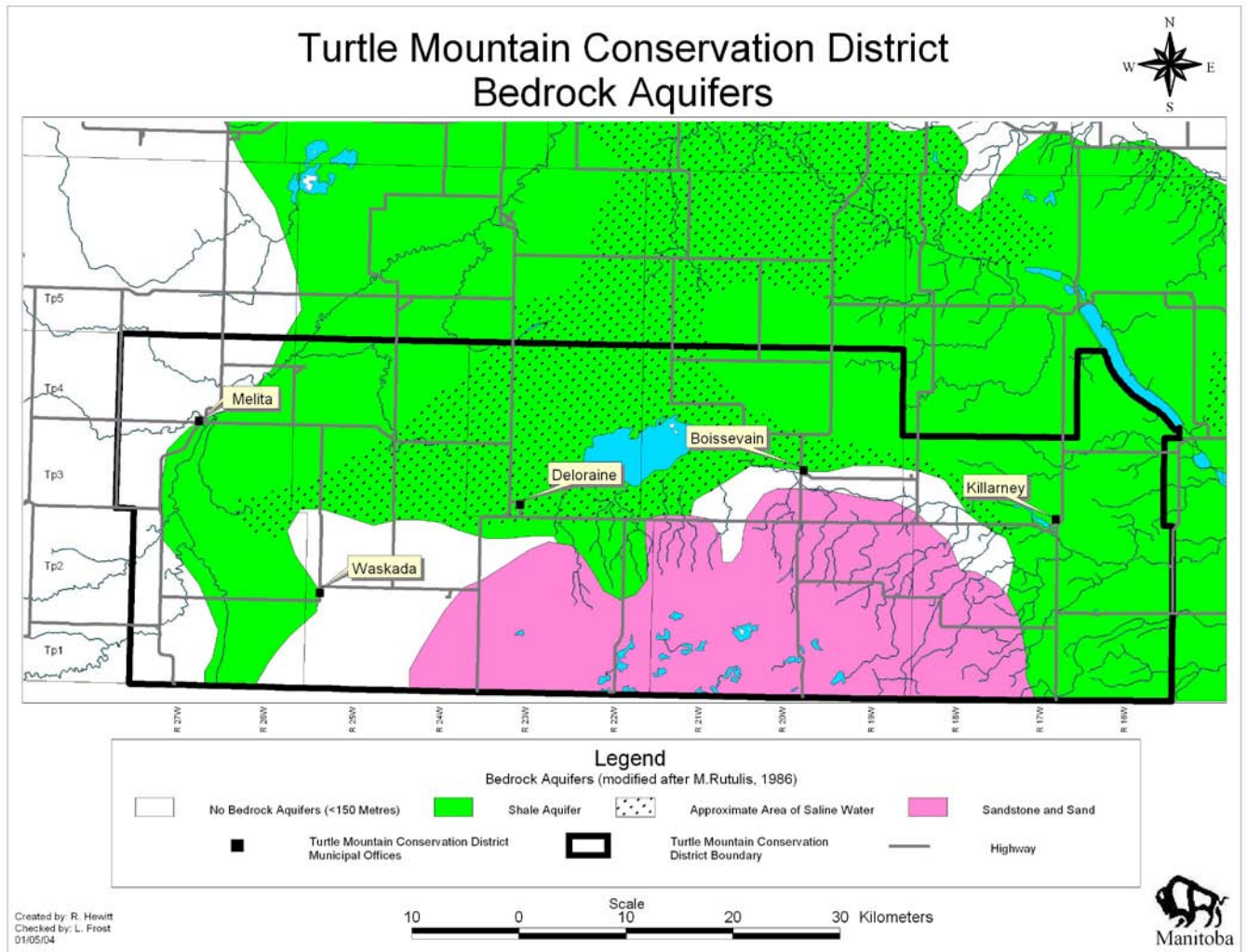
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Cc: P. Weiss
F. Render



Drawing 1: Sand and Gravel Aquifers within the Turtle Mountain Conservation District.



Drawing 2: Bedrock Aquifers within the Turtle Mountain Conservation District.