


# Manitoba Environment Act Proposal Town of Deloraine

March 2013

Dee Genaille, P.Eng



# Environment Act Proposal Form

|  |  |
|--|--|
| Name of the development: Town of Deloraine Water Treatment Plant Upgrade   |  |
| Type of development per Classes of Development Regulation (Manitoba Regulation 164/88):<br>Waste Disposal  |  |
| Legal name of the proponent of the development:<br>Town of Deloraine   | Mailing address: Box 510<br>Deloraine, MB R0M 0M0  |
| Location (street address, city, town, municipality, legal description) of the development:<br>Town of Deloraine<br>NE 03-03-23 W and SW 03-03-23 W |  |
| Name of proponent contact person for purposes of the environmental assessment:<br>Dee Genaille, P. Eng   |  |
| Phone: (204) 726-6080<br>Fax: (204) 726-7196   | Mailing address: The Manitoba Water Services Board<br>P.O. Box 22080<br>Brandon, MB R7A 6Y9  |
| Email address: dee.genaille@gov.mb.ca  |  |
| Webpage address:   |  |
| Date:<br><br>March 6, 2013   | Signature of proponent, or corporate principal of corporate proponent:<br><br>Printed name: Dee Genaille, M.Sc., P.Eng |

A complete Environment Act Proposal (EAP) consists of the following components:

- Cover letter
- Environment Act Proposal Form
- Reports/plans supporting the EAP (see "Information Bulletin - Environment Act Proposal Report Guidelines" for required information and number of copies)
- Application fee (Cheque, payable to Minister of Finance, for the appropriate fee)

Submit the complete EAP to:

Director  
Environmental Assessment and Licensing Branch  
Manitoba Conservation  
Suite 160, 123 Main Street  
Winnipeg, Manitoba R3C 1A5

For more information:

Phone: (204) 945-7100  
Fax: (204) 945-5229  
Toll Free: 1-800-282-8069, ext. 7100

<http://www.gov.mb.ca/conservation/eal>

|   |           |
|---|-----------|
| Per Environment Act Fees Regulation (Manitoba Regulation 168/96): |           |
| Class 1 Developments .....  | \$500     |
| Class 2 Developments .....  | \$5,000   |
| Class 3 Developments:   |           |
| Transportation and Transmission Lines.....                        | \$5,000   |
| Water Developments .....  | \$50,000  |
| Energy and Mining.....  | \$100,000 |

## Table of Contents

|  |    |
|--|----|
| Executive Summary.....                                     | 1  |
| List of Acronyms.....                                      | 2  |
| 1.0 Introduction .....                                     | 3  |
| 1.1 Background Information.....                            | 3  |
| 1.1.1 Previous Studies.....                                | 3  |
| 1.1.2 Population.....                                      | 4  |
| 1.1.3 Current and Projected Water Use .....                | 5  |
| 1.1.4 Raw Water Source .....                               | 5  |
| 1.1.5 Water Rights Act .....                               | 6  |
| 1.1.6 Water Quality.....                                   | 6  |
| 1.1.7 Compliance Plan.....                                 | 8  |
| 2.0 Description of Proposed Development.....               | 8  |
| 2.1 Project Description .....                              | 8  |
| 2.1.1 Operation and Maintenance.....                       | 10 |
| 2.2 Certificate of Title .....                             | 11 |
| 2.3 Existing and Adjacent Land Use .....                   | 11 |
| 2.4 Land Use Designation and Zoning.....                   | 11 |
| 2.5 Project Schedule .....                                 | 11 |
| 2.6 Project Funding.....                                   | 11 |
| 2.7 Regulatory Approvals.....                              | 11 |
| 2.8 Public Consultation .....                              | 12 |
| 2.9 Storage of Petroleum Products and Other Chemicals..... | 12 |
| 3.0 Physical Environment.....                              | 12 |
| 3.1 Physiographic Setting and Climate .....                | 12 |
| 3.2 Hydrogeology.....                                      | 13 |
| 3.3 Hydrology.....   | 13 |
| 3.4 Fish and Fish Habitat.....                             | 14 |
| 3.5 Wildlife Habitat and Vegetation .....                  | 14 |
| 3.6 Socio-economic.....                                    | 15 |
| 3.7 Heritage Resources .....                               | 15 |
| 4.0 Potential Environmental Effects .....                  | 15 |
| 4.1 Air Quality .....                                      | 15 |
| 4.2 Soils.....   | 16 |
| 4.3 Surface Water, Fish and Fish Habitat.....              | 16 |
| 4.4 Groundwater Quality .....                              | 18 |
| 4.5 Groundwater Levels.....                                | 18 |
| 4.6 Vegetation.....  | 18 |
| 4.7 Wildlife Habitat and Vegetation .....                  | 18 |

|      |   |    |
|------|---|----|
| 4.8  | Noise and Vibration .....               | 19 |
| 4.9  | Employment/Economy .....                | 19 |
| 4.10 | Human Health and Well Being.....        | 19 |
| 4.11 | Climate Change .....                    | 19 |
| 5.0  | Environmental Management Measures ..... | 20 |
| 5.1  | Air Quality .....                       | 20 |
| 5.2  | Soils .....                             | 20 |
| 5.3  | Surface Water .....                     | 20 |
| 5.4  | Groundwater.....                        | 20 |
| 5.5  | Vegetation and Wildlife .....           | 20 |
| 5.6  | Fisheries .....                         | 21 |
| 5.7  | Noise and Vibration .....               | 21 |
| 5.8  | Water Conservation .....                | 21 |
| 5.9  | Socio-Economic Implications .....       | 21 |
|      | References .....                        | 22 |
|      | Appendix A.....                         | 23 |
|      | Appendix B.....                         | 25 |
|      | Appendix C.....                         | 27 |
|      | Appendix D.....                         | 30 |
|      | Appendix E .....                        | 33 |
|      | Appendix F .....                        | 41 |
|      | Appendix G.....                         | 44 |

## Executive Summary

The Town of Deloraine requested The Manitoba Water Services Board (MWSB) to prepare an Environment Act Proposal for a Class 1 Development License under the Manitoba Environment Act for an upgrade to the Deloraine water treatment plant (WTP). This Environment Act proposal is submitted for the discharge of membrane concentrate resulting from the components of a new water treatment plant.

Currently, the WTP provides treatment and disinfection for approximately 977 people in the Town of Deloraine in the RM of Winchester. The existing Deloraine WTP has a rated capacity of 7.5 L/s and 454 m<sup>3</sup> of reservoir storage capacity. The reservoir is incapable of supplying fire storage requirements providing for future growth.

Raw water is withdrawn from a manmade reservoir located on the Turtlehead Creek, located southeast of the community. Current treatment process consists of conventional lime/soda ash coagulation, sedimentation and filtration treatment system. Prior to storage the water is recarbonated, chlorinated and fluoride is added. Water quality concerns include turbidity, manganese, high hardness and colour. Treatment parameters are reduced to meet the Guidelines for Canadian Drinking Water Quality (GCDWQ) with the occasional exception of turbidity. The current treatment system does not reduce organics adequately to prevent the formation of disinfection by-products such as THMs.

To meet drinking water guidelines, the proposed development includes the construction of a 12 L/s membrane WTP located next to the existing WTP in the Town of Deloraine. The proposed treatment system will have highly mineralized reject water discharged to a storage pond located 160 m to the east of the WTP. The 22,555 m<sup>3</sup> storage pond will be constructed to hold the equivalent of 200 days of storage (November to May). The cell will be drained twice per year to the East Medora Creek which empties into the Souris River. The proposed new plant will have an additional 926 m<sup>3</sup> reservoir capacity for a total storage of 1,380 m<sup>3</sup>. This size of reservoir would meet fire storage and future water storage requirements.

## List of Acronyms

|       |   |
|-------|---|
| AO    | Aesthetic Objective                                 |
| DBP   | Disinfection By-Product                             |
| DWSA  | Drinking Water Safety Act                           |
| EAP   | Environment Act Proposal                            |
| GCDWQ | Guidelines for Canadian Drinking Water Quality      |
| GUDI  | Groundwater Under Direct Influence of Surface Water |
| MWSB  | Manitoba Water Services Board                       |
| ODW   | Office of Drinking Water                            |
| RM    | Rural Municipality                                  |
| RO    | Reverse Osmosis                                     |
| TDS   | Total Dissolved Solids                              |
| THM   | Trihalomethanes                                     |
| TOC   | Total Organic Carbon                                |
| UF    | Ultrafiltration                                     |
| UV    | Ultraviolet   |
| WTP   | Water Treatment Plant                               |

## **1.0 Introduction**

The Town of Deloraine requested The Manitoba Water Services Board (MWSB) to prepare an Environment Act Proposal (EAP) to obtain a Class 1 Development License under the Manitoba Environment Act for an upgrade to the water treatment plant (WTP). This document provides the compiled information required in Manitoba Conservation's Environment Act Proposal Report Guidelines and Supplementary Guidelines for Municipal Water Supply Systems. This Environment Act Proposal is submitted for the discharge of membrane concentrate resulting from the new WTP process to the East Medora Creek.

### **1.1 Background Information**

In 1962 the MWSB constructed and operated a water treatment plant at the corner of Renton Avenue and Government Road in the southeast end of the Town of Deloraine. A manmade reservoir on the Turtlehead Creek, located southeast of the community provides the raw water supply for the town. Water is gravity fed from the reservoir to the treatment plant through an eight kilometre pipeline. The original plant consisted of a conventional process using coagulation, sedimentation and filtration treatment system. In 2000 the plant was upgraded to a new lime/soda ash treatment process. After clarification the water was recarbonated, filtered, chlorinated and fluoridated prior to storage and distribution.

Existing water storage at the WTP includes a 90 m<sup>3</sup> reservoir located beneath the plant and an adjacent 454 m<sup>3</sup> underground reservoir. The water tower that had been used for distribution and storage was decommissioned in 2004 when the pumping system was upgraded.

Lime sludge produced during the water treatment process is pumped to one of two clay-lined sludge dewatering cells located east of the WTP. The cells were constructed in 1994 and each cell has an approximate capacity of 5200 m<sup>3</sup>(<sup>1</sup>). Retention of the sludge allows particulate matter to settle while the supernatant is discharged to a surface water ditch which drains to the East Medora Creek. The sludge is disposed of at a licensed landfill. Environment Act Licence No. 1734 issued in December 1993 permits the Town of Deloraine to operate the dewatering sludge cells is included in Appendix D.

#### **1.1.1 Previous Studies**

A pre-design report for the water treatment plant upgrade was completed by Burnside Engineering in 1998. The report reviewed and summarized the design criteria and background information associated with the upgrade of the municipal water supply and treatment system for the Town of Deloraine. The report includes raw water quality and water demand projections.



In May 2001, Neegan Burnside Engineering and Environmental Ltd. prepared a pre-design report for the upgrade to the Town of Deloraine’s water distribution pumping system for domestic and fire flows.

J.R. Cousin Consultants Ltd. conducted an engineering assessment of the water system infrastructure and water supply source for the Deloraine public water system in March of 2009. The assessment analyzed conformance to the Drinking Water Safety Act (DWSA) and any potential adverse health risks with the water system. A need to increase reservoir capacity and improve the disinfection process was identified as required upgrades.

In October 2011, the MWSB prepared a report titled “Deloraine Water treatment Plant Upgrading Study”. This report focused on plant deficiencies identified in the engineering assessment completed by J.R. Cousin Consulting Ltd. The study presented the option of upgrading the water treatment process to utilize Ultrafiltration (UF) and Reverse Osmosis (RO) membrane technology to improve water quality to the town.

AECOM was retained by the MWSB to provide design services in 2013. The report provides design details required for upgrading the current WTP. The water treatment plant requires upgrading to meet drinking water standards in accordance with the DWSA and Guidelines of Canadian Drinking Water Quality (GCDWQ).

### 1.1.2 Population

Based on the 2011 Census, the Town of Deloraine has an estimated population of 977 residents <sup>(2)</sup>. The population trend for the town shows a decline since the 1980s with no change since 2006 (Figure 1.1).

For design purposes allowances were made for potential future growth. Assuming an annual growth rate of 0.5% over 20 years the predicted population of Deloraine would be 1079.

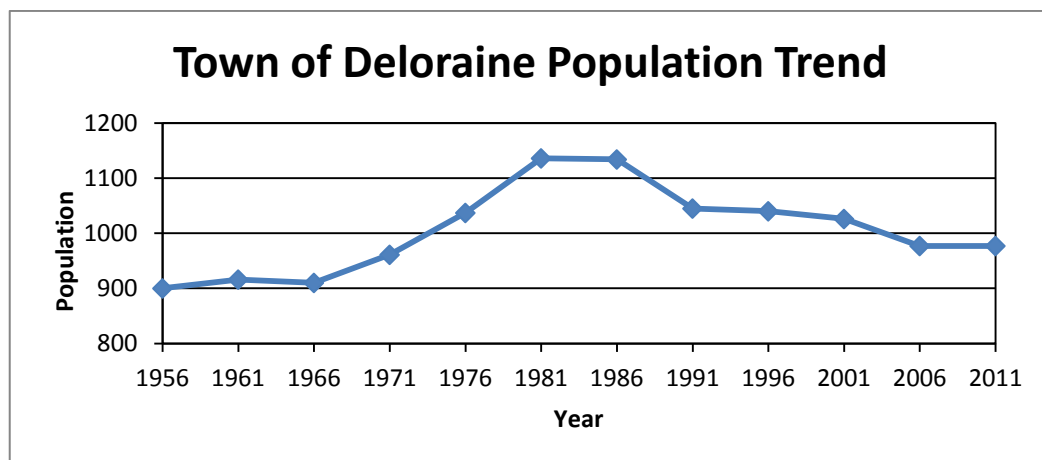


FIGURE 1.1 - POPULATION TRENDS



### 1.1.3 Current and Projected Water Use

Wastewater treatment plant capacity is designed on peak day demand. As stated in the Deloraine Water Treatment Plant Upgrading Study prepared by the MWSB <sup>(3)</sup> water consumption records for Deloraine from 2007 to 2010 show average daily water usage in the range of 250 L/capita/day to 350 L/capita/day with a peak day factor of 1.5 to 2.0. An average consumption of 300 L/capita/day (L/c/d) and a peak day factor of 1.66 were determined for the system, which is consistent with the typical consumption for rural towns in Manitoba.

Table 1.1 shows the required treatment capacity of 7.45 L/s based on the projected water demand for a 20 year future population and a 20 hour WTP operating day with the remaining four hours dedicated to maintenance operations.

**TABLE 1.1 - DELORAINA PROJECTED WATER DEMANDS**

| Projected Water Demands   |       |                   |
|---------------------------|-------|-------------------|
|                           | Unit  | Town of Deloraine |
| <b>20 Year Population</b> |       | 1,079             |
| <b>Consumption Rate</b>   | L/c/d | 300               |
| <b>Average Day Demand</b> | L/day | 323,765           |
| <b>Average Day Flow</b>   | L/s   | 4.50              |
| <b>Peak Day Demand</b>    | L/day | 536,491           |
| <b>Peak Day Factor</b>    |       | 1.66              |
| <b>Treatment Capacity</b> | L/s   | 7.45              |

### 1.1.4 Raw Water Source

The raw water source is provided by a reservoir on the Turtlehead Creek (Figure 1.2). The reservoir is located eight kilometres southeast of the Town and has a storage capacity of 1,726,900 m<sup>3</sup>.

The raw water intake structure is 34 metres above the WTP. Raw water passes through a screened inlet and flows by gravity through a 200 and 150 mm asbestos cement pipeline to the water plant.



**FIGURE 1.2 – DELORAINE RESERVOIR ON TURTLEHEAD CREEK**

### **1.1.5 Water Rights Act**

Water Rights Act Licence 2001-090 (see Appendix C) specifies that the water diverted from the Deloraine Dam Reservoir on Turtlehead Creek shall not exceed 271,370 m<sup>3</sup> annually or a maximum rate of 0.008 m<sup>3</sup>/s. Based on water meter records for the Deloraine WTP, the water supply is being operated within its Licence limits.

Based on the new treatment system requirements an application to amend the Water Rights Act Licence will be submitted. An amendment will be made to increase the pumping rate to a maximum of 0.017 m<sup>3</sup>/s. The annual usage required for the new treatment system is 165,444 m<sup>3</sup> which is below the current licenced annual usage so no amendment for this rate is required.

### **1.1.6 Water Quality**

The Office of Drinking Water (ODW) currently conducts annual audits of all public water systems which includes sampling and chemistry analysis once per year for surface water. The Turtlehead Creek provides a water supply that generally conforms to the Drinking Water Safety Act (DWSA) and the Guidelines for Canadian Drinking Water Quality (GCDWQ) with the exception of turbidity, manganese, hardness and color as shown in Table 1.2.

Controlling turbidity in public drinking water supplies is important for both health and aesthetic reasons. Turbidity can interfere with the disinfection process and can be associated with unacceptable taste and odours. Turbidity, particularly those associated with organic

matters can serve as a food source for bacteria, viruses and protozoa and can cause serious health problems. Turbidity standards for surface water indicate that where possible, filtration systems reduce turbidity levels as low as possible, with a target of less than 0.1 NTU at all times. Treated water turbidity levels from individual filters:

1. For **membrane filtration**, shall be less than or equal to **0.1 NTU** in at least 99% of the measurements made, or at least 99% of the time each calendar month, and shall not exceed 0.3 NTU at any time. If membrane filtration is the sole treatment technology employed, some form of virus inactivation should follow the filtration process.

According to GCDWQ, high Manganese in the raw water is not considered a health concern but can affect taste as well as staining of laundry and plumbing fixtures making the water undesirable.

Hardness can be classified as carbonate and non-carbonate hardness and is expressed as mg/l of CaCO<sub>3</sub> or grains. Carbonate hardness is associated with calcium and magnesium carbonates and bicarbonates. The non-carbonate hardness is due to mostly calcium and magnesium sulphates, chlorides and nitrates. Hardness is not a health hazard but is an aesthetic concern. Hardness above 200 mg/l can cause staining and scum deposits on bathroom fixtures. Hardness levels between 80 to 100 mg/l are acceptable, levels greater than 200 mg/l are considered poor but tolerable and those in excess of 500 mg/l are considered unacceptable. In Manitoba, potable water supplies with a total hardness in the range of 100 mg/l to 150 mg/l as CaCO<sub>3</sub> are considered acceptable.

Color in drinking water may be due to the presence of metals such as iron and manganese and is often an indicator of organic matter such as tannins. These substances can be the precursors to the formation of disinfection by-products when reacting with a disinfectant such as free chlorine. The presence of colour in drinking water is an aesthetic parameter affecting the appearance and palatability of water.

Following treatment, parameters are lowered to within the required regulations and guidelines. A disinfectant such as chlorine or ozone is used to produce microbiologically safer water. Disinfectants react with organic matter in the treated water to form disinfection by-products (DBPs) such as trihalomethanes (THMs) and haloacetic acids. DBPs are suspected carcinogens and short term exposure can lead to dizziness, headaches, as well as problems related to the central nervous system. Total organic levels in the treated water prior to chlorination need to be reduced to less than 2.0 mg/L to ensure THM levels of less than 100 µg/L based on a quarterly sample average. The current treatment method used at the Deloraine WTP does not sufficiently remove organic carbon and levels exceed the GCDWQ for THMs. An analysis of the water quality is summarized in Table 1.2.

**TABLE 1.2 WATER QUALITY RESULTS (2009 – 2010 ODW SAMPLING)**

| Parameter                             | Unit | Raw Water     | Treated Water    | GCDWQ                    |
|---------------------------------------|------|---------------|------------------|--------------------------|
| Hardness (Total) as CaCO <sub>3</sub> | mg/L | 342 - 410     | 112 - 136        | ≤ 200/500 <sup>a</sup>   |
| Iron                                  | mg/L | 0.024 - 0.066 | < 0.020          | ≤ 0.3                    |
| Manganese                             | mg/L | 0.243 - 0.351 | 0.0007 - 0.001   | ≤ 0.05                   |
| Trihalomethanes (THM)                 | µg/L | -             | <b>118 - 203</b> | ≤ 100 <sup>b</sup>       |
| Total Dissolved Solids                | mg/L | 472 - 497     | 370              | ≤ 500                    |
| Total Organic Carbon                  | mg/L | 11.8 - 15.6   | 5.3 - 8.7        |                          |
| True Colour                           | CU   | 10 - 50       | <b>10 - 30</b>   | ≤ 15                     |
| Turbidity                             | NTU  | 2 - 6         | ≈ 0.3            | ≤ 0.3 / 0.1 <sup>c</sup> |

<sup>a</sup> Hardness levels greater than 200 are considered poor but tolerable. Hardness levels greater than 500 are generally considered unacceptable

<sup>b</sup> THM based on average of quarterly samples

<sup>c</sup> Turbidity limits as follows: 1.0 NTU for slow sand or diatomaceous earth filtration, 0.3 NTU for chemically assisted filtration, and 0.1 NTU for membrane filtration

The treatment process must be able to achieve a 3-log removal/inactivation of *Giardia* and *Cryptosporidium* and a 4-log removal/inactivation of viruses in the surface raw water supply.

### 1.1.7 Compliance Plan

An engineering assessment was completed by J.R. Cousin Consulting Ltd. in March 2009<sup>(4)</sup>. The assessment concluded that the plant is not capable of producing water in compliance with Provincial regulations and has inadequate reservoir capacity for meeting current system demands.

## 2.0 Description of Proposed Development

### 2.1 Project Description

The proposed development includes the construction of a 12 L/s membrane WTP adjacent to the existing WTP. A pre-engineered steel building with a footprint of approximately 16.4 m x 25.2 m will be located 15 m south west of the existing WTP on land owned by the Town (Figure 2.1). A concrete reservoir and pumpwell will be built beneath the building. The reservoir will provide an additional 926 m<sup>3</sup> of storage. The preliminary floor plan for the WTP is included in Appendix A.

The WTP will utilize both ultrafiltration and reverse osmosis membranes in the treatment process.



**FIGURE 2.1 - LOCATION OF WTP**

This EAP pertains to the storage and discharge of the membrane unit reject to the storage pond and through the discharge route to the East Medora Creek. Highly mineralized reject water generated from the membrane treatment will be pumped to a storage pond which will be constructed 160 m east of the WTP.

The reject water will be discharged twice per year, in the spring and fall, to the East Medora Creek which joins the Medora Creek and ultimately discharges into the Souris River near the Village of Napinka. Based on the average day production of reject water of 108,000 L/day or 25% of the total raw water usage and 200 days of storage capacity the required pond volume will be 21,584 m<sup>3</sup>. The volume of the constructed storage pond will be 22,555 m<sup>3</sup> with the top inside berm measuring 150 x 100 m. The storage pond will include the volume of the existing lime sludge cells, which will be converted and expanded to the north of the existing cells as shown in Figure 2.2.

The proposed drainage pathway for the reject water will be the same used for supernatant from the existing lime sludge cells. The reject water will be pumped from the storage cell to a ditch that runs north and then east to the East Medora Creek.





FIGURE 2.2 – EXPANSION OF REJECT WATER STORAGE CELL

### 2.1.1 Operation and Maintenance

The Town of Deloraine will be responsible for the operation and maintenance of the WTP and distribution pipelines and reject water storage cell. The existing WTP in Deloraine is classified as a Class 1 facility. An application for reclassification will be required for the new WTP. The Town will ensure that all WTP operators are certified with the appropriate classification level.

The operators will be required to operate the WTP and distribution system in a safe and efficient manner in accordance with relevant operations manuals and DWSA regulations. Operation requirements will include measurements, monitoring, sampling, testing, record-keeping and reporting. The operators will receive training during the commissioning phase and will ensure the equipment is inspected and properly maintained. As currently required, periodic inspection, maintenance, bacteriological sampling and chlorine residual testing of the distribution pipelines will be necessary. Additional sampling for turbidity and trihalomethanes (THMs) of the treated water will be conducted as required by the DWSA regulations for surface water systems.

## **2.2 Certificate of Title**

The new WTP will be located adjacent to the existing WTP on land owned by the Town of Deloraine on NE 03-03-23 W.

The storage pond for the reject water will be built where the current sludge cells are located at NW 02-03-23 W. The Town of Deloraine currently owns the land where the existing cells are located and is in the process of purchasing the land required for the new pond expansion.

The proposed drainage pathway for the reject water will be the same as for the supernatant from the existing lime sludge cells which drains through municipal right-of ways.

The Certificates of Titles are provided in Appendix E.

## **2.3 Existing and Adjacent Land Use**

The land for the proposed reject water storage pond is currently used as the existing lime sludge cells and agriculture. Adjacent land is used for agriculture and residential purposes. Existing adjacent land use will not change as a result of this development.

## **2.4 Land Use Designation and Zoning**

Zoning designation for the pipelines on municipal owned land is not applicable.

## **2.5 Project Schedule**

The project is scheduled to commence in May 2013 and be completed by the end of 2013 with the receipt of all approvals.

## **2.6 Project Funding**

This project will be cost shared between the MWSB and the Town of Deloraine.

## **2.7 Regulatory Approvals**

The following branches/departments will be provided with copies of plans and specifications for information purposes and for the purposes of approvals and agreements:

Manitoba Conservation and Water Stewardship  
Office of Drinking Water

The contractor will be required to contact MTS, Hydro and gas utilities for utility locations and approvals.



## **2.8 Public Consultation**

Public consultation is not anticipated as the upgrade will result in positive improvements to water quality and infrastructure. Currently the sludge cells discharge supernatant to the East Medora Creek and no significant changes are anticipated with the proposed discharge of the membrane reject water.

## **2.9 Storage of Petroleum Products and Other Chemicals**

Fuel will not be stored on-site at any time in the proposed construction area. Fuel will be supplied by fuelling trucks which are regulated under The Storage and Handling of Petroleum Products and Allied Products Regulation. Records of fuel volumes and an emergency response plan including spill prevention, notification and response will be implemented. No fuelling activities will be permitted within 100 m of watercourses during construction. During construction the contractors will be required to ensure that all equipment is properly maintained to prevent leaks of fuel and motor fluids.

Chemicals associated with the operation of the plant will be stored in designated areas within the plant complete with spill containment. General household cleaning products will also be stored at the WTP site.

## **3.0 Physical Environment**

### **3.1 Physiographic Setting and Climate**

The Town of Deloraine is located in south-western Manitoba in the Rural Municipality of Winchester. It is approximately 110 km southwest of Brandon near Turtle Mountain Provincial Park on Provincial Highway #3. Topography varies with an elevation of 425 metres in the northwest along the Souris River to an elevation of 495 m near the WTP. The reservoir on the Turtlehead Creek dam is at an elevation of 530 m.

Based on Environment Canada climatic data shown in Table 3.1, the mean annual temperature in the area is 3.3 degrees Celsius with below zero average daily temperatures from November through March. Mean annual precipitation is 478.1 mm.

**TABLE 3.1 ENVIRONMENT CANADA HISTORICAL WEATHER – DELORAINÉ, MANITOBA <sup>(5)</sup>**

| Temperature               | Jan   | Feb   | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec   | Year  |
|---------------------------|-------|-------|------|------|------|------|------|------|------|------|------|-------|-------|
| Daily Average (°C)        | -15.5 | -12.2 | -4.7 | 4.9  | 12.6 | 17.1 | 19.5 | 18.5 | 12.2 | 5.4  | -4.5 | -13.2 | 3.3   |
| Daily Maximum (°C)        | -9.7  | -6.7  | 0.6  | 11.2 | 19.3 | 23.5 | 26.1 | 25.4 | 18.6 | 11.5 | 0.3  | -7.9  | 9.3   |
| Daily Minimum (°C)        | -21.3 | -17.6 | -9.9 | -1.3 | 5.8  | 10.6 | 12.8 | 11.6 | 5.7  | -0.9 | -9.2 | -18.5 | -2.7  |
| <b>Precipitation (mm)</b> |       |       |      |      |      |      |      |      |      |      |      |       |       |
| Rainfall (mm)             | 0.4   | 0.3   | 3.7  | 22.8 | 47.8 | 85.3 | 67.4 | 58.5 | 50.7 | 24.2 | 4.1  | 0.8   | 366   |
| Snowfall (cm)             | 19.1  | 14    | 20.7 | 11   | 2.1  | 0.2  | 0    | 0    | 0.5  | 9.8  | 16.5 | 18.5  | 112.3 |
| Precipitation (mm)        | 19.6  | 14.3  | 24.4 | 33.8 | 49.9 | 85.3 | 67.4 | 58.5 | 51.2 | 33.9 | 20.6 | 19.3  | 478.1 |

### 3.2 Hydrogeology

A report prepared for the Turtle Mountain Conservation District in 1978 using data from the Water Resources Division of the Department of Mines, Resources and Environmental Management <sup>(6)</sup> indicates that Deloraine is situated in the physiographic area of the District known as the Lowland. This area occupies the north and west part of the Conservation District. Groundwater in this area is generally salty, of very poor quality or is not available. The water supply for the Town of Deloraine is from a surface water reservoir.

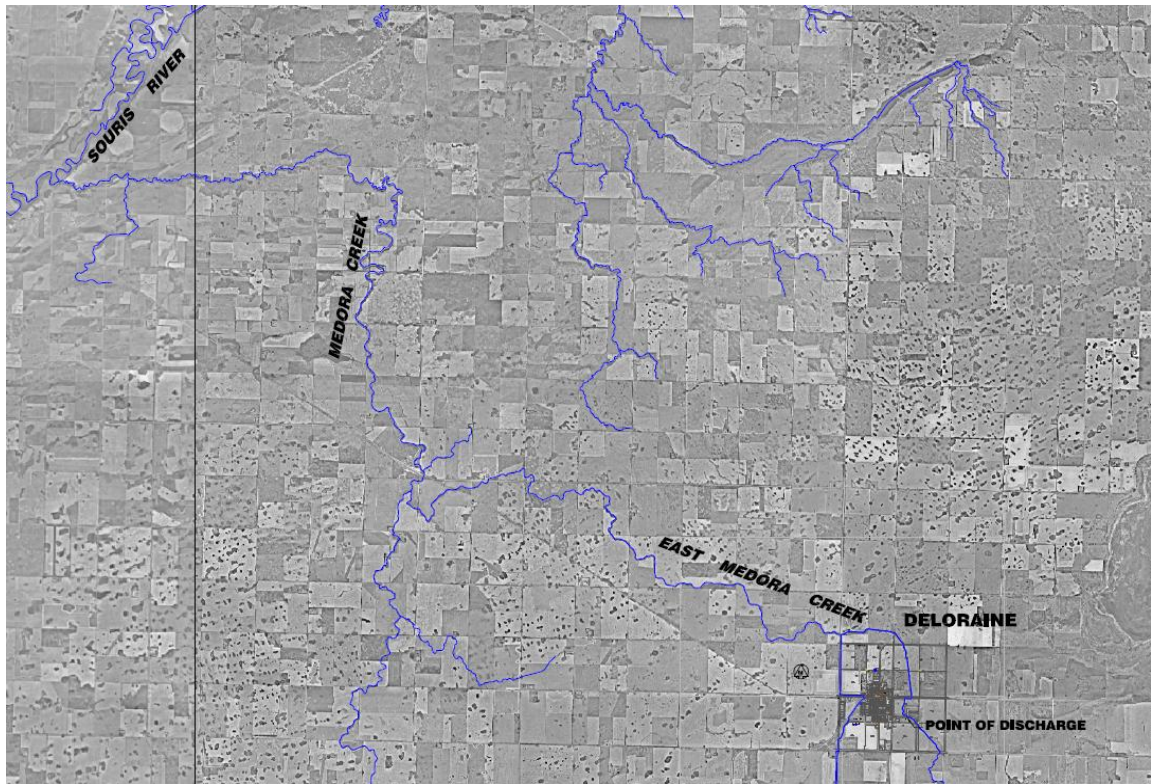
The field investigation conducted by AECOM in 2013 for the Town of Deloraine Water Treatment Plant Functional Design Report <sup>(1)</sup> included drilling of four test holes within the proposed facility footprint. Seepage was encountered in two of the test holes at 4.6 m below the ground surface. A standpipe piezometer was installed and the water level was measured in the standpipe at 7.7 m below ground surface.

### 3.3 Hydrology

As part of the East Souris River (ESR) watershed, the Medora Creek is one of four main tributaries that flow into the Souris River <sup>(7)</sup>. It originates on the northern slopes of the Turtle Mountains and flows northwesterly entering the Souris River near the Village of Napinka. Branches of the Medora Creek, the West Medora Creek and the East Medora Creek run on the west and east sides of the Town of Deloraine as shown in Figure 3.3. Flow in the Medora Creek is intermittent throughout the year, primarily after spring thaw in the March to May period and occasionally after heavy rainfall <sup>(8)</sup>.

The Souris River originates in Saskatchewan, is approximately 720 km long, and has a drainage area of 45,000 km<sup>2</sup>.

The Deloraine reservoir constructed on Turtlehead Creek covers 31 ha and contains 1,730 dam<sup>3</sup> when operated at full supply level. The drainage area of the reservoir is 76.7 km<sup>2</sup>.



**FIGURE 3.3 – HYDROLOGY FEATURES NEAR THE PROPOSED WTP DEVELOPMENT**

### **3.4 Fish and Fish Habitat**

Potential fish habitat in the project area includes the East Medora Creek which runs on the east side of the Town of Deloraine, the Medora Creek and the Souris River. Native fish species of the Souris River are northern pike, bullhead, walleye, shorthead redhorse sucker and white sucker, in addition to numerous species of minnow <sup>(6)</sup>. Non native species that exist include small and large mouth bass, brown and rainbow trout.

### **3.5 Wildlife Habitat and Vegetation**

The project area is located within the Aspen Parkland Ecoregion of the Prairies ecozone <sup>(9)</sup>. The ecoregion is classified as having a transitional grassland ecoclimate. Most of the ecoregion is now farmland but in its native state, the landscape was characterized by trembling aspen, oak groves, mixed tall shrubs, and intermittent fescue grasslands. The ecoregion provides a major breeding habitat for waterfowl and includes habitat for white-tailed deer, coyote, snowshoe hare, cottontail, red fox, northern pocket gopher, Franklin's ground squirrel, and bird species like sharp-tailed grouse and black-billed magpie. It produces a wide diversity of crops, including spring wheat and other cereals, oilseeds, as well as forages and several specialty crops. The project area has been developed for agricultural uses resulting in reduction of habitat for several of these species.

The proposed WTP site and storage cell are located within an area containing numerous potholes which are part of the prairie pothole region extending from southern Alberta to western Manitoba and south into South Dakota. This is the most important waterfowl production area in North America. In Manitoba, water fowl conservation efforts through the North American Waterfowl Management Plan (NAWMP) are concentrated in the prairie pothole region. NAWMP programs target lands with high capacity for waterfowl production, which includes lands classified as 1 to 3 by the Canada Land Inventory (CLI) Land Capability for Waterfowl classification system. The WTP and cell are located within lands generally classified CLI 4 and 5 which have moderate limitations to the production of waterfowl<sup>(10)</sup>.

### **3.6 Socio-economic**

The project area is located within the Town of Deloraine. The town has an area of approximately 2.25 km<sup>2</sup> and a population of approximately 977 people and 498 private dwellings<sup>(2)</sup>. The community offers a hospital, a K-12 school and various businesses such as hotels, banking institutions, a gas station and grocery store. The main economic base is agriculture with a growing contribution from the oil industry. Nestibo Agra, a sunflower seed processing facility established in 1996 contributes to the Deloraine economy.

### **3.7 Heritage Resources**

Most project activities will occur in previously disturbed municipal and agricultural lands. The proponent will work with Heritage Resources Branch to mitigate any concerns as required.

## **4.0 Potential Environmental Effects**

An environmental effect includes any change that the project may cause to the environment. Environmental effects were identified from interactions between proposed project activities and environmental components. Mitigation measures and follow-up activities were identified for environmental effects determined to be adverse.

### **4.1 Air Quality**

During construction, dust and gaseous and particulate emissions will be created by the construction equipment. Dust suppression will be employed by the application of water to alleviate potential dust problems. Emissions of gases and particulate matter will be minimized by keeping machinery in good working order. Any effects would be localized, temporary and insignificant. During operation of the development there will be no releases of pollutants to the air.

## 4.2 Soils

During construction, there is a risk of fuel or lubricant spills from heavy equipment and vehicle operation. The storage of fuel or lubricants on the construction site will not be allowed. Potential spills will be small and will follow standard construction spill clean-up procedures, including the removal of impacted soil.

During operation, activities are limited to regular monitoring and maintenance which have a negligible effect on soil disturbance and compaction. Regular monitoring and maintenance activities have a negligible effect on soil contamination since fuel trucks and other hazardous substances will not be required on-site. The potential adverse effect on soil quality is assessed to be minor.

## 4.3 Surface Water, Fish and Fish Habitat

No water quality is available for the East Medora Creek or the Medora Creek. The nearest surface water quality data available for the Souris River is provided by the Water Quality Management Section of Manitoba Conservation and Water Stewardship <sup>(11)</sup> and is used to determine the potential impact of the proposed reject water discharge (Table 4.1). Complete results of the sample are attached in Appendix F.

Membrane concentrate stream contains hardness causing minerals such as calcium and magnesium. The projected membrane concentrate quality is summarized in Table 4.1 and the complete results are displayed in Appendix G.

**TABLE 4.1 WATER QUALITY RESULTS (APRIL 2012)**

| Parameter | Unit | Projected Reject | Souris River |
|-----------|------|------------------|--------------|
| Hardness  | mg/L | 1626.6           | 314          |
| TDS       | mg/L | 2712.9           | 672          |
| Sodium    | mg/L | 80.1             | 91           |
| Potassium | mg/L | 38.7             | 12.1         |
| Iron      | mg/L | 0.1              | 0.59         |
| Manganese | mg/L | 1.0              | 0.165        |
| Sodium    | mg/L | 80.1             | 91           |
| Sulphate  | mg/L | 667.6            | 265          |
| Chloride  | mg/L | 51.1             | 23           |
| pH        | -    | 8.4              | 8.3          |

Flow data and the monthly average flows from 2000-2010 collected at the hydrometric flow station (05NF001) located on the Souris River at Melita, MB <sup>(12)</sup> are summarized in Table 4.2. The estimated amount of concentrate reject water released annually to the storage pond is approximately 39,420 m<sup>3</sup>. The storage pond will be discharged twice per year to the East Medora Creek where it will travel with the Medora Creek and ultimately discharge in the Souris River. Reject water from similar systems has been discharged to surface water bodies in other locations across Manitoba without having significant adverse effects to water quality. The Town of Deloraine will perform long-term sampling of the drain water to verify water quality impacts.

**TABLE 4.2 MONTHLY MEAN DISCHARGES FOR SOURIS RIVER (M<sup>3</sup>/S)**

|             | Jan | Feb | Mar    | Apr   | May   | Jun  | Jul  | Aug  | Sep  | Oct  | Nov | Dec |
|-------------|-----|-----|--------|-------|-------|------|------|------|------|------|-----|-----|
| <b>2002</b> | -   | -   | 0.2410 | 0.343 | 0.531 | -    | -    | -    | -    | -    | -   | -   |
| <b>2003</b> | -   | -   | 4.58   | 11.8  | 9.50  | -    | -    | -    | -    | -    | -   | -   |
| <b>2004</b> | -   | -   | 0.010  | 2.40  | 4.85  | -    | -    | -    | -    | -    | -   | -   |
| <b>2005</b> | -   | -   | 1.47   | 36.9  | 19.2  | 49.7 | 94.0 | -    | -    | -    | -   | -   |
| <b>2006</b> | -   | -   | 2.02   | 43.0  | 21.1  | -    | -    | -    | -    | -    | -   | -   |
| <b>2007</b> | -   | -   | 0.744  | 1.59  | 0.200 | -    | -    | -    | -    | -    | -   | -   |
| <b>2008</b> | -   | -   | 0.020  | 0.066 | 0.039 | -    | -    | -    | -    | -    | -   | -   |
| <b>2009</b> | -   | -   | -      | -     | 98.3  | -    | -    | -    | -    | -    | -   | -   |
| <b>2010</b> | -   | -   | 7.97   | 27.1  | 16.8  | 26.2 | 43.4 | 18.0 | 18.6 | 18.3 | -   | -   |

Impacts to fisheries and fish habitat are considered minor.

Based on the proposed storage pond design a maximum discharge rate of concentrate to the East Medora Creek is estimated to be 36.7 L/s. The reject water ultimately flows to the Souris River. Table 4.3 provides the impact of the combined flow discharge on the Souris River during periods of low and high flows. The low and high flows are based on the monthly averages collected over a 9 year period as shown in Table 4.2. During high flow conditions, the impact of the discharged concentrate is negligible. During low flow conditions there is a small measurable impact. At low flow conditions, TDS is increased approximately by 5%. It should be noted that during the fall discharge the East Medora Creek flow may only consist of the membrane concentrate alone.

**TABLE 4.3 EFFECTS OF REJECT WATER ON RIVER QUALITY**

| Parameter | Reject | Souris River | Low Flow | High Flow |
|-----------|--------|--------------|----------|-----------|
|           | (L/s)  |              | (L/s)    | (L/s)     |
| Flow Rate | 36.7   |              | 2166.7   | 687,035.7 |
|           | (mg/L) | (mg/L)       | (mg/L)   | (mg/L)    |
| Hardness  | 1627   | 314          | 336      | 314       |
| TDS       | 2713   | 672          | 706      | 672       |
| Sodium    | 80     | 91           | 91       | 91        |
| Potassium | 39     | 12           | 13       | 12        |
| Iron      | 0      | 1            | 1        | 1         |
| Manganese | 1      | 0            | 0.2      | 0.2       |
| Sodium    | 80     | 91           | 91       | 91        |
| Sulphate  | 668    | 265          | 272      | 265       |
| Chloride  | 51     | 23           | 23       | 23        |

#### 4.4 Groundwater Quality

Groundwater quality can be impacted by surface activities and surface water quality. Mitigation measures will be implemented to protect groundwater quality during construction activities.

#### 4.5 Groundwater Levels

There are no changes to ground water withdrawal and no anticipated impact to groundwater levels as a result of this project.

#### 4.6 Vegetation

Construction will occur primarily on agricultural lands that are previously disturbed, regularly managed, comprised primarily of crops and grasses. As the areas are already disturbed, they are unlikely to contain rare plant species. The amount of vegetation disturbance is expected to be minimal. Potential effects to vegetation are considered to be negligible.

#### 4.7 Wildlife Habitat and Vegetation

The construction and operation activities associated with this project will be limited to areas already developed for urban or agricultural uses. The potential adverse effects of wildlife habitat loss were assessed to be negligible to minor.



#### **4.8 Noise and Vibration**

During the construction phase of the project, there will be several sources of sound emissions from the equipment used for construction. The types of noises heard due to construction are dominated by equipment engines, however, miscellaneous short term impact noises (ie: dump truck gates, back hoe buckets) are often heard. The noise will be in addition to regular community noises and the effects are considered minor.

Scheduling of site activities can minimize the impact of noise, including scheduling construction for day-time hours. All equipment used on site will be fitted with appropriate mufflers and will be maintained in good working order to minimize noise levels.

#### **4.9 Employment/Economy**

Socio-economic implications are not expected as a result of environmental impacts as impacts are considered minor and short term. Some economic implications may exist for Deloraine due to the costs of developing the treatment system. However, the Town will have a sustainable potable water supply to meet future demands. There will be some positive local economic benefit during construction.

The proposed project will address the issue of poor water quality. The potential effects of the project on employment and the economy were assessed to be positive.

#### **4.10 Human Health and Well Being**

The potential adverse effects of the project on human health are assessed to be negligible to minor. Short term temporary increases in noise and dust emissions will occur during construction that are considered to be minor effects. During operation, there will be a minor increase in vehicular traffic associated with monitoring and maintenance activities. The potential effects are considered minor.

The project will result in the construction of a water treatment plant designed and operated to produce treated water to meet current water quality standards. The effects of this on human health and well-being are proven to be positive.

#### **4.11 Climate Change**

There are no predicted impacts to climate as a result of the project activities.

## **5.0 Environmental Management Measures**

Environmental management practices proposed to prevent or mitigate environmental effects that were determined to be adverse are identified and described below.

### **5.1 Air Quality**

Emissions resulting from construction and transportation equipment may be mitigated by the utilization of well maintained and operating vehicles and reducing unnecessary vehicle idling.

The impact of dust may be mitigated by the use of an approved dust suppressant, limiting construction during high wind periods and re-establishing vegetation as soon as possible.

### **5.2 Soils**

Mitigating potential soil contamination from petroleum products will be accomplished by the preparation of a response plan for potential spills, using spill clean-up equipment and materials, properly maintained equipment and appropriate fuelling equipment.

Re-establishing vegetation as quickly as possible following construction will limit loss of soil due to wind or water erosion.

### **5.3 Surface Water**

Mitigation of surface water issues will be achieved by redirecting surface water runoff and providing erosion control practices and silt fencing as required.

Petroleum leaks or spills will be mitigated by using properly maintained equipment, spill clean-up equipment and materials and appropriate fuelling equipment. The emergency response will follow guidelines from the specification in the event of a significant spill. In the event of a reportable spill, Manitoba Conservation and Water Stewardship will be notified through the emergency response line and appropriate measures taken according to Manitoba Conservation and Water Stewardship requirements.

A 100 m setback from watercourses will be maintained for fuelling activities.

### **5.4 Groundwater**

No impacts or environmental measures are anticipated.

### **5.5 Vegetation and Wildlife**

Re-establishing vegetation will occur as soon as possible in disturbed areas. Impacts to wildlife habitat will be limited by minimizing the area of construction, soil disturbance and vegetation

disturbance. Other impacts resulting from dust or smoke will be minimized as previously indicated. Noise disturbance will be limited by use of muffling vehicles and equipment, and limiting idling.

## **5.6 Fisheries**

Fisheries impacts will be minimized by implementing practices to reduce soil and contaminate runoff as previously mentioned in Sections 5.3 and 5.5.

## **5.7 Noise and Vibration**

Limiting any noise-creating activities, including regular maintenance and monitoring activities to normal working hours and unnecessary idling can mitigate any potential increased noise and vibration effects.

## **5.8 Water Conservation**

The construction and implementation of the storage pond will contribute to water conservation in the system.

## **5.9 Socio-Economic Implications**

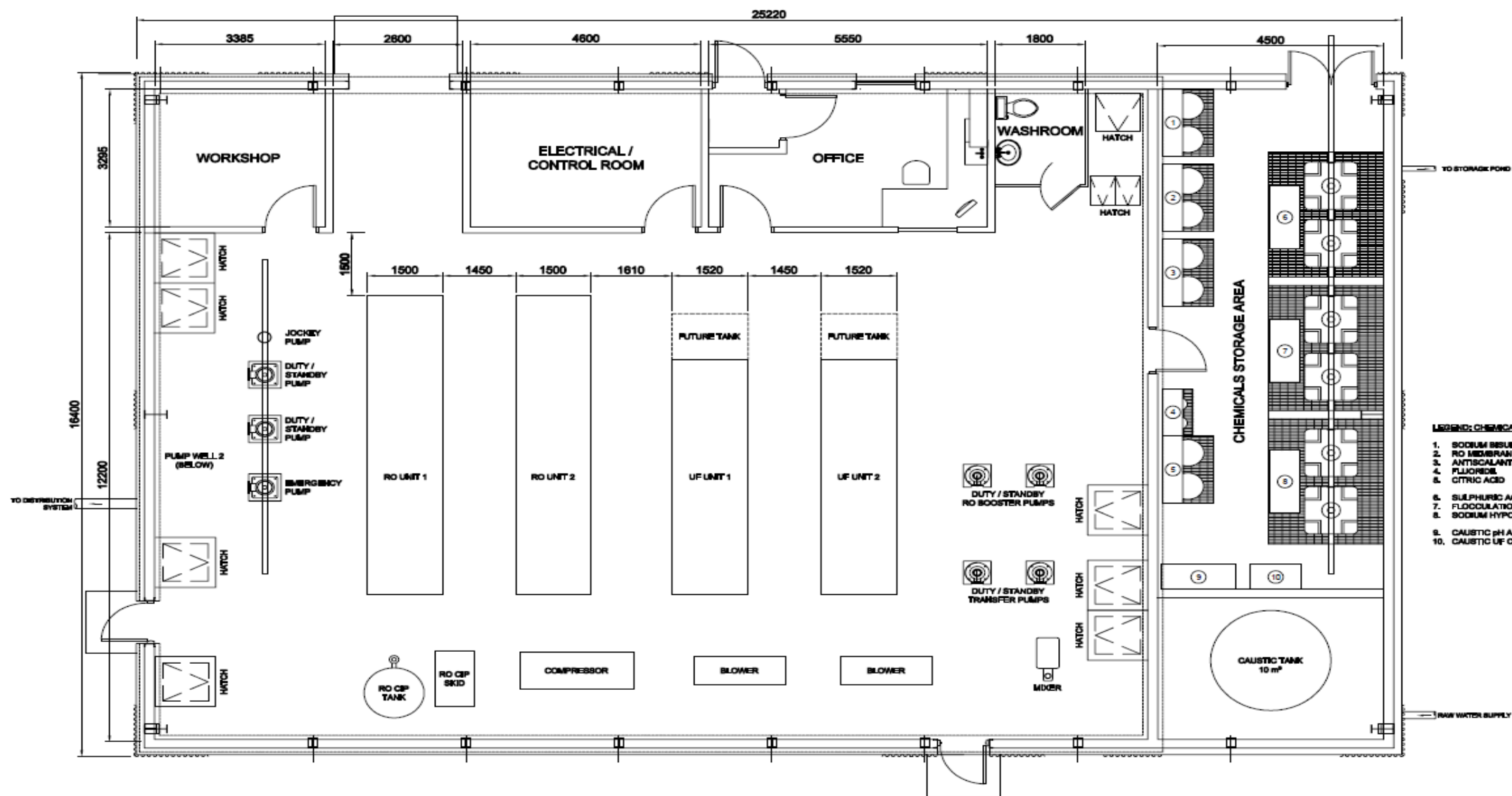
There are no known negative environmental socio-economic impacts that need mitigation. Since the proposed development would provide a reliable healthy drinking water supply, it is expected to enhance quality of life and economic viability for the town. The proposed project may provide some economic benefits to the area for local businesses and employment opportunities during the construction phase.

## References

- 1) AECOM, *Town of Deloraine Water Treatment Plant Functional Design Report*. January 2013.
- 2) Statistics Canada, 2011 Census Profiles, Town of Deloraine. <http://www12.statcan.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E> (accessed February 06, 2013)
- 3) The Manitoba Water Services Board, *Deloraine Water Treatment Plant Upgrading Study*. October 2011.
- 4) J.R. Cousin Consultants Ltd., *Town of Deloraine Assessment of Water System Infrastructure and Water Supply Source for the Deloraine Public Water System*. March 2009.
- 5) Environment Canada, Historical Weather, Climate Normals and Averages, Deloraine Manitoba. [http://www.climate.weatheroffice.gc.ca/climate\\_normals/index\\_e.html](http://www.climate.weatheroffice.gc.ca/climate_normals/index_e.html) (accessed February 06, 2013)
- 6) Rutulis, M., *Groundwater Resources in the Turtle Mountain Conservation District*. October 1978.
- 7) Turtle Mountain Conservation District, *Taking Care of Our Watershed*. January 2006.
- 8) Eilers, Robert G., *Relations Between Hydrogeology and Soil Characteristics Near Deloraine, Manitoba*. February 1973.
- 9) Agriculture and Agri-Food Canada. A National Ecological Framework for Canada. <http://sis.agr.gc.ca/cansis/nsdb/ecostrat/intro.html> (accessed February 05, 2013)
- 10) Natural Resources Canada. Canada Land Inventory, Land Capability for Waterfowl. <http://geogratis.cgdi.gc.ca/geogratis/en/collection/cli.html> (accessed February 05, 2013)
- 11) Water Quality Management Section Manitoba Conservation and Water Stewardship. *Water Quality Data: Souris River*. April 2012.
- 12) Environment Canada. Souris River at Melita (05NF001). <http://www.wsc.ec.gc.ca/applications/H2O/report-eng.cfm?station=05NF001&report=daily&year=2011> (accessed February 06, 2013)

## **Appendix A**

### Preliminary Floor Plan



**MAIN FLOOR PLAN**  
NTS

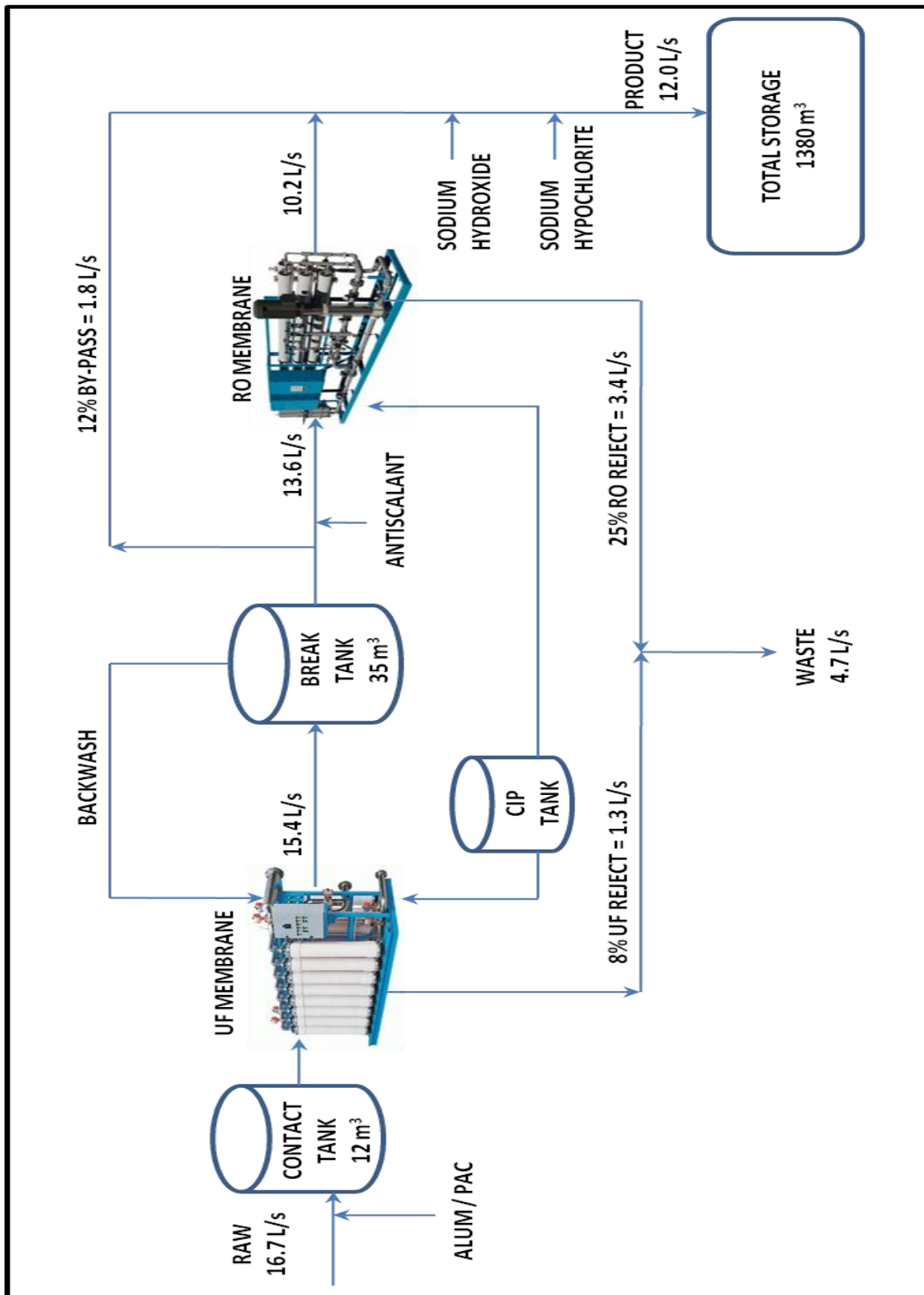
- LEGEND: CHEMICAL STORAGE & DOSING SLOTS**
1. SODIUM BISULFITE
  2. RO MEMBRANE CLEANER
  3. ANTISCALANT
  4. FLUORIDE
  5. CITRIC ACID
  6. SULPHURIC ACID
  7. FLOCCULATION COAGULANT
  8. SODIUM HYPOCHLORITE
  9. CAUSTIC pH ADJUSTMENT
  10. CAUSTIC UF CLEANING



## **Appendix B**

### Membrane Flow Diagram





Deloraine Proposed Treatment Process – Flow Schematic

## **Appendix C**

### Water Rights Licence

**Licence to Use Water for  
Municipal  
Purposes**

Manitoba  
Conservation  
Water Branch

200 Saulteaux Cresc.  
Winnipeg, Manitoba  
R3J 3W3



Issued in accordance with the provisions of  
**The Water Rights Act** and regulations made thereunder.

Licence No.: **2001-090**  
(Original Lic. No.: 63-07)  
U.T.M.: Zone 14 396707 E  
5445140 N

Know all men by these presents that in consideration of and subject to the provisions, conditions and restrictions hereinafter contained, the Minister of Conservation for the Province of Manitoba does by these presents give full right and liberty, leave and licence to **The Town of Deloraine** in the Province of Manitoba (hereinafter called "the LICENSEE") to divert water from the **Deloraine Dam Reservoir on Turtlehead Creek** by means of a wet well water intake chamber constructed on the

**the west side of the dam reservoir within the road allowance south of SW 30-2-22W,**

and to convey the diverted raw water by means of a pipeline constructed from the water inlet chamber in a northwest direction to the raw water storage facilities and water treatment plant located at a site in the Town of Deloraine described as:

**that portion of Block 39 Plan 444 BLTO Bois. Div. as shown on Plan 387 BLTO Bois. Div., in NE 3-3-23W,**

(all the raw water diversion works hereinafter collectively called the "WORKS").

This licence is issued upon the express condition that it shall be subject to the provisions of the Water Rights Act and Regulations and all amendments thereto and, without limiting the generality of the aforesaid, to the following terms and conditions, namely:

1. The raw water diverted from the **Deloraine Dam Reservoir on Turtlehead Creek** shall be used solely for **municipal** purposes.
2. The collective WORKS shall be operated in accordance with the terms herein contained.
3. The rate at which water shall be diverted pursuant hereto shall not exceed **0.008 cubic metres per second (0.3 cubic feet per second)** and the total quantity diverted in any one year shall not exceed **246.7 cubic decametres (200.00 acre feet)**.
4. The LICENSEE does hereby remise, release and forever discharge Her Majesty the Queen in Right of the Province of Manitoba, of and from all manner of action, causes of action, claims and demands whatsoever which against Her Majesty the LICENSEE ever had, now has or may hereafter have, resulting from the use of water for **municipal** purposes.
5. In the event that the rights of others are infringed upon and/or damage to the property of others is sustained as a result of the operation or maintenance of the WORKS and the rights herein granted, the LICENSEE shall be solely responsible and shall save harmless and fully indemnify Her Majesty the Queen in Right of the Province of Manitoba, from and against any liability to which Her Majesty may become liable by virtue of the issue of this Licence and anything done pursuant hereto.
6. This Licence is not assignable or transferable by the LICENSEE and when no longer required by the LICENSEE this Licence shall be returned to the said Minister for cancellation.
7. Upon the execution of this Licence the LICENSEE hereby grants the said Minister and/or his Agents the right of ingress and egress to and from the said lands for the purpose of inspection of the WORKS and the LICENSEE shall at all times comply with such directions and/or orders that may be given by the Minister or his Agents in writing from time to time with regard to the operation and maintenance of the WORKS and appurtenances.
8. If for any reason whatsoever the Minister deems it advisable to cancel this Licence, he may do so by letter addressed to the LICENSEE at **Box 510, Deloraine, MB, R0M 0M0, Canada** and thereafter this Licence shall be determined and at an end.
9. This Licence shall be effective for a term of **twenty (20) years** and this Licence shall become effective only on the date of execution hereof by a person so authorized in the Department of Conservation. The LICENSEE may apply for renewal of this Licence not more than 365 days and not less than 90 days prior to the expiry date.
10. Records of daily and annual water use must be kept by the LICENSEE for each calendar year, and a copy of such records shall be furnished to the Director, Water Branch, and/or his agents not later than February 1st of the following year.
11. For the purpose of recording water use, as noted in Term No. 10, the LICENSEE will be required to install on the pumping WORKS, a water measuring device, acceptable to the Director, Water Branch, that will accurately calculate the instantaneous water flow and the accumulated annual water quantity, withdrawn from the water source.
12. The LICENSEE must hold valid and subsisting approval from all regulatory agencies that may be required, for the establishment, or construction, or operation and maintenance of the water diversion works and the diversion and use of water from the **Deloraine Dam Reservoir on Turtlehead Creek** in SW 30-2-22W

- 13. The LICENSEE shall, at all times, comply with all regulatory requirements of Fisheries and Oceans Canada in respect to fish habitat protection provisions of Canada's Fisheries and Oceans Act, with respect to the establishment, or construction, or operation and maintenance of the water diversion works and the diversion and use of water from the **Deloraine Dam Reservoir on Turtlehead Creek** in SW 30-2-22W.

In witness whereof I the undersigned hereby agree to accept the aforesaid Licence on the terms and conditions set forth therein and hereby set my hand and seal this 25th day of October A.D. 20 01.

SIGNED, SEALED AND DELIVERED  
in the presence of

\_\_\_\_\_ } R.H. Amey (Seal)  
 Witness Licensee R.H. Amey, C.A.O.  
 Town of Deloraine

Canada, PROVINCE OF MANITOBA To Wit:

I, \_\_\_\_\_ of the \_\_\_\_\_  
of \_\_\_\_\_ in the Province of Manitoba, MAKE OATH AND SAY:

- 1. That I was personally present and did see \_\_\_\_\_ the within named party, execute the within Instrument.
- 2. That I know the said \_\_\_\_\_ and am satisfied that he/she is of the full age of eighteen years.
- 3. That the said Instrument was executed at \_\_\_\_\_ aforesaid and that I am subscribing witness thereto.

SWORN BEFORE me at the \_\_\_\_\_  
in the Province of Manitoba this \_\_\_\_\_ day of \_\_\_\_\_ A.D. 20 \_\_\_\_\_.

\_\_\_\_\_ }  
 A COMMISSIONER FOR OATHS Witness  
 in and for the Province of Manitoba

My Commission expires \_\_\_\_\_

Issued at the City of Winnipeg, in the Province of Manitoba, this 29 day of October A.D. 20 01.

[Signature]  
 The Honourable the Minister of Conservation

## **Appendix D**

### Environment Act Licence for Sludge Dewatering Facility

# Environment Act Licence

Manitoba  
Environment



Licence No. 1734

Issue Date DECEMBER 17, 1993

In accordance with the Manitoba Environment Act (C.C.S.M. c. E125)

THIS LICENCE IS ISSUED TO:

## TOWN OF DELORAINE: "the Licencee"

for the construction and operation the Development being a Water Treatment Plant (Wastewater) sludge dewatering facility located on the NW1/4 Section 2, Township 3, Range 23 WPM, with discharge of supernatant to the East Branch of the Deloraine Drain and the final disposal of dewatered sludge at the Town of Deloraine waste disposal ground, and subject to the following specifications, limits, terms and conditions:

### DEFINITIONS

In this Licence,

"**Director**" means an employee so designated under The Environment Act;

"**sludge dewatering beds**" means the facility for the separation of the sludges wasted from the Town of Deloraine water treatment plant;

"**waste disposal ground**" means an area of land designated by a person, municipality, provincial government agency, or crown corporation for the disposal of waste and approved for use in accordance with Manitoba Regulation 150/91 as amended from time to time.

### GENERAL SPECIFICATIONS

1. The Licencee shall ensure that domestic wastewater is not directed to the sludge dewatering beds.
2. The Licencee shall ensure that laboratory wastes are not directed to the sludge dewatering beds.
3. The Licencee shall, in case of physical or mechanical breakdown of the sludge dewatering beds:
  - (a) notify the Director immediately;
  - (b) identify the repairs required to the wastewater collection and/or treatment system; and

MG-15492



Town Of Deloraine  
Water Treatment Plant  
Licence No.: 1734  
Page 2

- (c) complete the repairs in accordance with the written instructions of the Director.
4. Unless otherwise specified, all laboratory analyses shall be conducted in accordance with the latest edition of "Standard Methods For The Examination Of Water and Wastewater."

**LIMITS, TERMS, AND CONDITIONS**

5. The Licencee shall not discharge effluent from the sludge dewatering beds:
- (a) where the suspended solids content of the effluent is in excess of 25 milligrams per litre; or
- (b) between the 1st day of November of any year and the 1st day of May of the following year.
6. The Licencee shall ensure that dewatered sludge solids are disposed of at a waste disposal ground.

**CONSTRUCTION SPECIFICATIONS**

7. The Licencee shall, prior to the construction of the dikes for the sludge dewatering beds:
- (a) remove all organic topsoil from the area where the dikes will be constructed; or
- (b) remove all organic material for a depth of 0.3 metres and a width of 3.0 metres from the area where the dike will be built, provided all the sludge dewatering beds dikes are lined with clay or other suitable material as required by Clause 7.
8. The Licencee shall construct the sludge dewatering beds with clay or other suitable material such that all interior surfaces of the lagoon structure incorporate a continuous layer, a minimum of 1 metre thick, of soil having a hydraulic conductivity of  $1 \times 10^{-7}$  centimetres per second or less.

**REVIEW OR REVOCATION**

If in the opinion of the Director the Licencee has exceeded or is exceeding the specifications, limits, terms, or conditions set out herein, the Director may revoke, temporarily or permanently, this Licence.

ORIGINAL SIGNED BY  
L. STRACHAN, P. ENG.

\_\_\_\_\_  
Larry Strachan, P. Eng.  
Director, Environment Act

FILE NO: 3605.00

## **Appendix E**

### Certificates of Title



FEB-19-2013 TUE 02:46 PM TOWN OF DELORAINÉ FAX NO. 204 747 2927 P. 23  
02/19/2013 14:10 MELISSA M LANLISSEY LAW CLERK FAX/02/19/13 P.022/029

|                     |                         |                                    |
|---------------------|-------------------------|------------------------------------|
| DATE: 2013/02/13    | TITLE SEARCH            | PASSL1                             |
| TSTL (1 OF 9)       | TITLE DISPLAY - BRANDON | PAGE: 01                           |
| TITLE NUMBER.....   | 1679721/2               | TITLE STATUS..... ACCEPTED         |
| REGISTRATION DATE.. | 1999/10/29              | ASSESSMENT OFFICE.. ** MANITOBA ** |
| COMPLETION DATE...  | 1999/11/02              | CONSOLIDATION..... NO              |

LEGAL DESCRIPTION:

THE TOWN OF DELORAINÉ

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON IN  
THE FOLLOWING DESCRIBED LAND,

THAT PORTION OF BLOCK 39 PLAN 444 BLTO BO DIV BORDERED PINK  
AS SHOWN ON PLAN 387 BLTO BO DIV EXC ALL MINES AND MINERALS  
AS SET FORTH IN TRANSFER NO. 8515BO

IN NE 1/4 3-3-23 WPM

TX: \_\_\_\_\_

DA: \_\_\_\_\_

*Building  
of  
water plant*

FEB-19-2013 TUE 02:48 PM TOWN OF DELORAINE FAX NO. 204 747 2927 P. 24  
19.11 STELLAN W LAW/BERY LAN CURT (FARJON/4/2100) F.1123/0228

DATE: 2013/02/13 TITLE SEARCH PASSLA1  
TSTC (2 OF 9) TITLE DISPLAY - BRANDON PAGE: 01  
TITLE NUMBER..... 1679721/2 TITLE STATUS..... ACCEPTED  
REGISTRATION DATE.. 1999/10/29 ASSESSMENT OFFICE.. \*\* MANITOBA \*\*  
COMPLETION DATE... 1999/11/02 CONSOLIDATION..... NO  
CHARGE LIST FROM... BEGINNING

EFFECT AFFECTING  
REG.NO. ON TITLE INSTRUMENT TYPE/STATUS NOTES (REG.DATE)

TX: \_\_\_\_\_ ENTRY TO DISPLAY  
DA: \_\_\_\_\_ PF6-TSEC  
NO CHARGES FOUND FOR THIS TITLE

FEB-19-2013 TUE 02:47 PM TOWN OF DELORAINE FAX NO. 204 747 2927 P. 25  
02/19/2013 14:11 DELORAIN W LAWRENCE LAW LUMP (PAX)02/19/2013 TOWN OF DELORAIN  
DATE: 2013/02/13 TITLE SEARCH  
TSTS (3 OF 9) TITLE DISPLAY - BRANDON  
TITLE NUMBER..... 1679721/2 TITLE STATUS..... ACCEPTED  
REGISTRATION DATE.. 1999/10/29 ASSESSMENT OFFICE.. \*\* MANITOBA \*\*  
COMPLETION DATE... 1999/11/02 CONSOLIDATION..... NO

SUMMARY OF TITLE DATA

TITLE NOTES..... SELECT ONE OF THE FOLLOWING:  
ORIGINATING REG. NUMBER.. 1071183/2 MORE? NO .... -  
FROM TITLE NUMBER..... 33847BO/2 TYPE... ALL MORE? NO .... -  
RPA/CROWN GRANT NUMBER... MORE? NO .... -

NAME FOR SERVICE..... THE TOWN OF DELORAINE MORE? NO .... -  
ADDRESS..... BOX 510  
DELORAIN MB

POSTAL CODE..... ROMOMO EFFECT... ACTIVE  
DUPLICATE PRODUCED ? .... MORE? NO .... -  
ISSUED DATE.....

TX: \_\_\_\_\_ NEXT TITLE NUMBER... \_\_\_\_\_  
DA: \_\_\_\_\_

NO MORE INFORMATION EXISTS REGARDING THIS SCREEN

**MANITOBA**  
 Certificate of Title  
 UNDER THE REAL PROPERTY ACT

Address For Service  
 Box 510  
 Deloraine, Man  
 R0M 0M0

Cert. No. 200651

District Of Brandon

Sworn Value: \$ n/a  
 Consideration: \$ n/a

From Title: 47281 RO, 190899  
 and 190900 bal  
 Instrument No.: 92-817

THE TOWN OF DELORAINE

is registered owner, subject to such entries recorded hereon, in the following described land,

Public Reserve as shown on Plan 27847 B/L70  
 exc all mines and minerals as set forth  
 in Transfer No. 8850 RO Div

In NE 1/4 3-3-23 WPM.

Public Reserve beside existing water plant building  
*Edelgin*  
 District Registrar

Signed by me this 24th day of January 1992.

| Type | Instrument Number | Date | Land Transferred To | For the New C.T. Number | For the District Registrar |
|------|-------------------|------|---------------------|-------------------------|----------------------------|
|      |                   |      |                     |                         |                            |

PHOTOCOPY MADE JAN 27 1992  
 NOT A DUPLICATE ORIGINAL

FEB-19-2013 TUE 02:44 PM TOWN OF DELORAINÉ      FAX NO. 204 747 2927      P. 08  
02/13/2013 14:08 SHELDON W LANCHBERY LAW CORP      (FAX)2047472180      P.007/024  
DATE: 2013/02/13      TITLE SEARCH      PASSLA1  
TSTL (1 OF 9)      TITLE DISPLAY - BRANDON      PAGE: 01  
TITLE NUMBER..... 1421054/2      TITLE STATUS..... ACCEPTED  
REGISTRATION DATE.. 1996/01/24      ASSESSMENT OFFICE.. \*\* MANITOBA \*\*  
COMPLETION DATE.... 1996/01/30      CONSOLIDATION..... NO  
LEGAL DESCRIPTION:  
THE TOWN OF DELORAINÉ

IS REGISTERED OWNER SUBJECT TO SUCH ENTRIES RECORDED HEREON IN THE FOLLOWING DESCRIBED LAND:

LOT 1 PLAN 31555 BLTO  
EXC FIRSTLY: OUT THAT PORTION THEREOF FORMERLY SHOWN AS LOT 4 SP  
PLAN 729 BLTO (BO DIV)  
ALL MINES AND MINERALS, COAL, GRAVEL AND VALUABLE STONE AS SET FORTH  
IN TRANSFER NO. 52405 (BO DIV)  
SECONDLY: OUT OF THAT PORTION THEREOF FORMERLY SHOWN AS LOT 5 SP  
PLAN 729 BLTO (BO DIV)  
ALL MINES AND MINERALS AS SET FORTH IN TRANSFER NO. 59908 (BO DIV)  
IN NW 1/4 2-3-23 WPM

TX: \_\_\_\_\_  
DA: \_\_\_\_\_

*Drainage  
Home pit*

FEB-19-2013 TUE 02:44 PM TOWN OF DELORAINE FAX NO. 204 747 2927 P. 09  
02/19/2013 14:08 SHELDON H LANCHBERY LAW CORP (FAX)2047472180 P.008/024  
DATE: 2013/02/13 TITLE SEARCH PASS1A1  
TSTC (2 OF 9) TITLE DISPLAY - BRANDON PAGE: 01  
TITLE NUMBER..... 1421054/2 TITLE STATUS..... ACCEPTED  
REGISTRATION DATE.. 1996/01/24 ASSESSMENT OFFICE.. \*\* MANITOBA \*\*  
COMPLETION DATE.... 1996/01/30 CONSOLIDATION..... NO  
CHARGE LIST FROM... BEGINNING  
EFFECT AFFECTING  
REG.NO. ON TITLE INSTRUMENT TYPE/STATUS NOTES (REG.DATE)

TX: \_\_\_\_\_ ENTRY TO DISPLAY  
DA: \_\_\_\_\_ PF6-TSEC  
NO CHARGES FOUND FOR THIS TITLE

FEB-19-2013 TUE 02:44 PM TOWN OF DELORAINÉ FAX NO. 204 747 2927 P. 10  
02/13/2013 14DB SHELTON W LANCHBERY LAN COMP (MAN/01/218) P.10/2013  
DATE: 2013/02/13 TITLE SEARCH  
TSTS (3 OF 9) TITLE DISPLAY - BRANDON PASSLAL  
TITLE NUMBER..... 1421054/2 TITLE STATUS..... ACCEPTED  
REGISTRATION DATE.. 1996/01/24 ASSESSMENT OFFICE.. \*\* MANITOBA \*\*  
COMPLETION DATE.... 1996/01/30 CONSOLIDATION..... NO

SUMMARY OF TITLE DATA

TITLE NOTES..... SELECT ONE OF THE FOLLOWING:  
ORIGINATING REG. NUMBER.. 1000893/2 MORE? NO ....  
FROM TITLE NUMBER..... 217133/2 TYPE.... ALL MORE? NO ....  
RPA/CROWN GRANT NUMBER... MORE? NO ....  
NAME FOR SERVICE..... THE TOWN OF DELORAINÉ MORE? NO ....  
ADDRESS..... P.O. BOX 510  
DELORAINÉ MB  
POSTAL CODE..... ROMOMO EFFECT... ACTIVE  
DUPLICATE PRODUCED ? .... MORE? NO ....  
ISSUED DATE.....  
TX: \_\_\_\_\_ NEXT TITLE NUMBER... \_\_\_\_\_  
DA: \_\_\_\_\_

NO MORE INFORMATION EXISTS REGARDING THIS SCREEN



## **Appendix F**

### Water Quality Results

|                                |                                       |          |
|--------------------------------|---------------------------------------|----------|
| STATION_NO                     | MB05NFS024                            |          |
| STATION_NAME                   | SOURIS RIVER                          |          |
| STATION_DESCRIPTION            | SOURIS RIVER EAST OF MELITA ON HWY #3 |          |
| SAMPLE_DATETIME                | 4/16/2012 10:00:00 AM                 |          |
| ALKALINITY CO3(CALCD_)         | 112                                   | mg/L     |
| ALKALINITY OH(CALCD_)          | 16.8                                  | mg/L     |
| ALKALINITY TOTAL CaCO3         | 214                                   | mg/L     |
| ALKALINITY TOTAL HCO3(CALCD_)  | 260                                   | mg/L     |
| ALUMINUM DISSOLVED             | 0.002                                 | mg/L     |
| ALUMINUM TOTAL                 | 0.376                                 | mg/L     |
| ANTIMONY TOTAL                 | 0.00024                               | mg/L     |
| ARSENIC TOTAL                  | 0.00273                               | mg/L     |
| BARIUM TOTAL                   | 0.0601                                | mg/L     |
| BERYLLIUM TOTAL                | 0.0002                                | mg/L     |
| BISMUTH TOTAL                  | 0.0002                                | mg/L     |
| BORON TOTAL                    | 0.086                                 | mg/L     |
| CADMIUM TOTAL                  | 0.00004                               | mg/L     |
| CALCIUM TOTAL                  | 54.4                                  | mg/L     |
| CARBON TOTAL INORGANIC         | 48.9                                  | mg/L     |
| CARBON TOTAL ORGANIC (TOC)     | 16.4                                  | mg/L     |
| CARBON TOTAL                   | 65.4                                  | mg/L     |
| CESIUM TOTAL                   | 0.0001                                | mg/L     |
| CHLORIDE (CL)                  | 22.7                                  | mg/L     |
| CHROMIUM HEXAVALENT DISSOLVED  | 0.01                                  | mg/L     |
| CHROMIUM TOTAL (CR)            | 0.001                                 | mg/L     |
| COBALT TOTAL                   | 0.00069                               | mg/L     |
| COLOUR TRUE                    | 24.1                                  | CU       |
| CONDUCTIVITY (AT 25C)          | 929                                   | uS/cm    |
| COPPER TOTAL (CU)              | 0.00208                               | mg/L     |
| DEPTH OF SAMPLING FROM SURFACE | 0                                     | m        |
| HARDNESS TOTAL (CALCD_) CaCO3  | 314                                   | mg/L     |
| IRON TOTAL (FE)                | 0.59                                  | mg/L     |
| LEAD TOTAL                     | 0.00063                               | mg/L     |
| LITHIUM TOTAL                  | 0.0514                                | mg/L     |
| MAGNESIUM TOTAL                | 43.4                                  | mg/L     |
| MANGANESE TOTAL (MN)           | 0.165                                 | mg/L     |
| MOLYBDENUM TOTAL               | 0.00271                               | mg/L     |
| NICKEL TOTAL                   | 0.0036                                | mg/L     |
| PH                             | 8.3                                   | pH units |
| POTASSIUM TOTAL                | 12.1                                  | mg/L     |

|                           |         |            |
|---------------------------|---------|------------|
| RUBIDIUM TOTAL            | 0.00172 | mg/L       |
| SELENIUM TOTAL            | 0.001   | mg/L       |
| SILICON TOTAL             | 1.33    | mg/L       |
| SILVER TOTAL              | 0.0001  | mg/L       |
| SODIUM TOTAL              | 90.8    | mg/L       |
| STRONTIUM TOTAL           | 0.273   | mg/L       |
| SULPHATE (SO4)            | 265     | mg/L       |
| TELLURIUM TOTAL           | 0.0002  | mg/L       |
| TEMPERATURE WATER (FIELD) | 4       | Deg C      |
| THALLIUM TOTAL            | 0.0001  | mg/L       |
| THORIUM TOTAL             | 0.0001  | mg/L       |
| TIN TOTAL                 | 0.0002  | mg/L       |
| TITANIUM TOTAL            | 0.0126  | mg/L       |
| TOTAL DISSOLVED SOLIDS    | 672     | mg/L @180C |
| TOTAL SUSPENDED SOLIDS    | 36      | mg/L       |
| TURBIDITY                 | 22.8    | Ntu        |
| URANIUM TOTAL             | 0.00352 | mg/L       |
| VANADIUM TOTAL            | 0.00258 | mg/L       |
| ZINC TOTAL (ZN)           | 0.005   | mg/L       |
| ZIRCONIUM TOTAL           | 0.00048 | mg/L       |

\* Water quality data provided by Water Quality Management Section, Manitoba Conservation and Water Stewardship

## **Appendix G**

### Projected Reject Quality

GE Water

Streams Analytical Data

| Ions, mg/l             |       | Dosed Final Permeate | Product | Concentrate |
|------------------------|-------|----------------------|---------|-------------|
| Calcium                |       | 0.79                 | 13.02   | 326.31      |
| Magnesium              |       | 0.11                 | 7.53    | 197.77      |
| Sodium                 |       | 4.22                 | 6.64    | 80.13       |
| Potassium              |       | 0.42                 | 1.86    | 38.67       |
| Ammonia - N            |       | 0.00                 | 0.01    | 0.21        |
| Barium                 |       | 0.00                 | 0.01    | 0.25        |
| Strontium              |       | 0.00                 | 0.06    | 1.53        |
| Iron                   |       | 0.00                 | 0.00    | 0.10        |
| Manganese              |       | 0.00                 | 0.04    | 0.96        |
| Sulfate                |       | 0.28                 | 24.40   | 667.64      |
| Chloride               |       | 0.04                 | 1.95    | 51.06       |
| Fluoride               |       | 0.00                 | 0.04    | 0.91        |
| Nitrate                |       | 0.01                 | 0.06    | 1.31        |
| Bromide                |       | 0.00                 | 0.00    | 0.00        |
| Phosphate              |       | 0.00                 | 0.05    | 1.31        |
| Boron                  |       | 0.05                 | 0.06    | 0.21        |
| Silica                 |       | 0.14                 | 1.48    | 35.76       |
| Hydrogen Sulfide       |       | 0.00                 | 0.00    | 0.00        |
| Bicarbonate            |       | 14.34                | 63.05   | 1295.31     |
| Carbon Dioxide         |       | 0.92                 | 1.09    | 11.20       |
| Carbonate              |       | 0.01                 | 0.26    | 13.45       |
| TDS, mg/l              |       | 20.43                | 120.51  | 2712.89     |
| Flow                   | l/sec | 8.50                 | 10.00   | 2.84        |
| Temperature            | C     | 1.70                 | 1.70    | 1.70        |
| Pressure               | psi   | 0.00                 | 0.00    | 150.63      |
| Osm. Pressure          | psi   | 0.16                 | 0.76    | 14.86       |
| pH                     |       | 7.60                 | 8.15    | 8.35        |
| S&DI                   |       | -3.58                | -1.18   | 1.64        |
| Conductivity           | µS/cm | 24.00                | 167.00  | 2848.00     |
| <b>Saturation Data</b> |       |                      |         |             |
| BaSO4                  | %     | 0.22                 | 46.25   | 2046.04     |
| CaF2                   | %     | 0.00                 | 0.00    | 18.12       |
| CaSO4                  | %     | 0.00                 | 0.46    | 28.00       |
| SiO2                   | %     | 0.17                 | 1.83    | 44.33       |
| SrSO4                  | %     | 0.00                 | 0.19    | 7.35        |
| CaPO4                  | %     | 0.00                 | 0.00    | 863.54      |
| Struvite               | %     | 0.00                 | 0.00    | 29.50       |
| LSI                    |       | -4.27                | -0.66   | 1.71        |

Classification: GE Internal