MMM Group Limited

RED RIVER PLANNING DISTRICT DRINKING WATER PLAN

Prepared for:
Red River Planning District

Submitted by:

MMM GROUP

December 2014 | 5513128.130

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STANDARD LIMITATIONS

This report was prepared by MMM Group Limited (MMM) for the account of Red River Planning District (the Client). The disclosure of any information contained in this report is the sole responsibility of the client. The material in this report reflects MMM's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. MMM accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions based on this report.

EXECUTIVE SUMMARY

The purpose of this plan is to highlight drinking water needs and considerations related to future land use planning for the six member municipalities of the Red River Planning District (RRPD). This plan was prepared in accordance with requirements under the *Planning Act* and considerations for water quality, system capacity, and withdrawal volumes are reported.

As communities grow and develop, the supply and distribution of drinking water is an essential planning component. Based on population, the total current annual groundwater demand for domestic purposes in the RRPD is 5.1 million m^3.

The Upper Carbonate Aquifer is the groundwater source for wells for all uses including drinking water. Regionally, the groundwater quality for the RRPD is generally good to excellent and is considered to be hard water based on chemistry. The southeast portion of the Upper Carbonate Aquifer is of poorer quality west of the Red River, yet east of the Red River water is much better quality.

Groundwater wells are licensed for specific withdrawal volumes and the systems are monitored by municipal staff; there are 38 Water Rights Licenses approved or in the approval process within the RRPD. The total annual licensed water withdrawal volume for all uses in the RRPD is 8.6 million m^3. From the licensed total volume, 3.7 million m^3 is licensed for municipal uses, including drinking water.

Based on population, the total annual domestic withdrawal from municipal systems is 1.4 million m^3; this suggests that significantly more water volume could be withdrawn. However, private water systems are not licensed and therefore not accounted for in terms of withdrawal volumes. Total annual withdrawal volumes from private systems are estimated to be 3.7 million m^3. Therefore, the current estimated total annual domestic water withdrawal from public (1.4 million $m3$) and private systems (3.7 million m^3) in the RRPD is 5.1 million m^3. This volume is 38% higher than the 3.7 million m^3 currently licensed for municipal use.

As population of the RRPD is projected to increase, water demand will increase as well. If no new licensed volumes are issued over the next 20 years, domestic water demand will surpass the current licensed volumes by 76.9%.

As future growth patterns for each municipality are unique, municipalities must individually assess their current situation, future population projections, and opportunities. Recommendations are offered relating to public systems, semi-public systems, private systems, and regional infrastructure sharing opportunities.

1.0 INTRODUCTION

1.1 Purpose and Methods

The purpose of this plan is to highlight drinking water supply needs and considerations related to future land use planning in the Red River Planning District (RRPD). This report is submitted as part of the RRPD Development Plan review process and research and information gathering was conducted concurrently with the RRPD Wastewater Management Plan. Information related to land use designations, population changes and growth patterns for the municipalities has been integrated into both the drinking water and wastewater plans.

1.2 Context

The Red River Planning District's (RRPD) Development Plan guides land use planning for its six member municipalities (Figure 1).

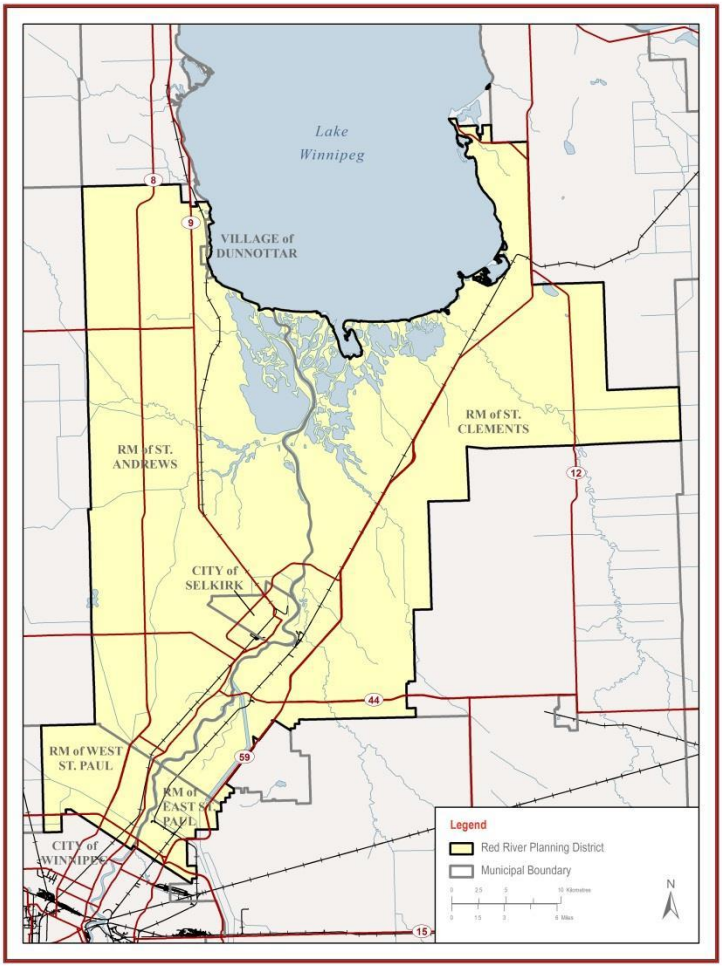


Figure 1: Red River Planning District Municipalities

Supply and distribution of drinking water is an essential planning component for the future as communities grow and develop. Groundwater and surface water are available sources of drinking water for municipalities in the RRPD and drinking water is currently provided through a combination of public, semi-public and private water systems. The total current annual groundwater demand for domestic purposes within the six RRPD municipalities is 5.1 million m^3. This calculation is based on the 2011 population of 46,888 and assumes an average daily water consumption of 300 litres (L) per person per day as suggested in Manitoba's Guide to Drinking Water. Figure 2 shows the proportion of the groundwater demand for each municipality based upon an average daily consumption volume of 300L per person.

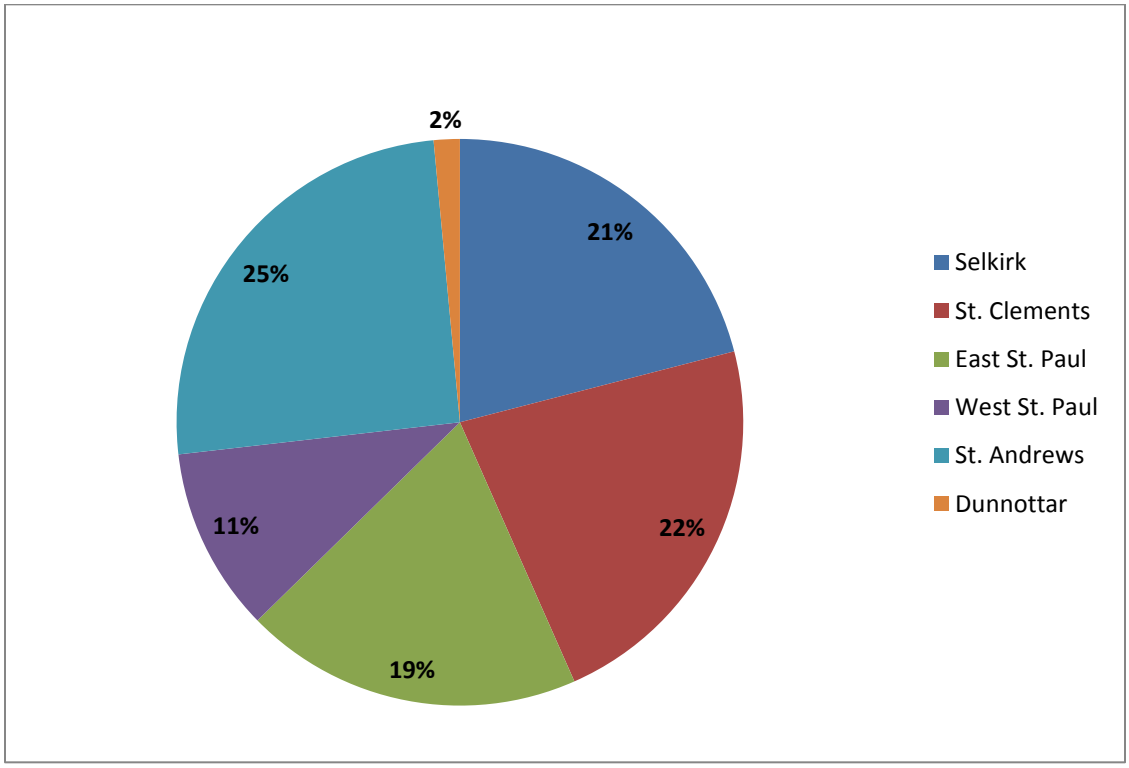


Figure 2: Proportion of Annual Domestic Groundwater Demand by Municipality

1.3 Report Format

This report is organized into two main sections for drinking water background information and planning: *Regional Perspective* and *Municipal Perspective*.

The *Regional Perspective* section covers legislative aspects, water allocation and licensing, general future growth patterns, population changes and infrastructure sharing potential. It identifies those areas within the planning district that may require a more coordinated approach to planning drinking water infrastructure to meet increasing demand in the future. Groundwater protection information is presented in the context of watershed management and the importance of coordinated land use planning.

The *Municipal Perspective* section provides drinking water information for each municipality within the RRPD. Section topics include current water sources and infrastructure, current and future demands, financing and regional participation.

2.0 REGIONAL PERSPECTIVE

2.1 Regulatory Framework

This Drinking Water Plan was prepared in accordance with requirements under *The Planning Act* where planning authorities within the capital region must prepare drinking water management plans as part of the Development Plan process. Considerations for water quality, system capacity, and withdrawal volumes are part of the Plan.

The regulation of public and semi-public drinking water systems to ensure protection of human health in Manitoba is the responsibility of Manitoba Conservation and Water Stewardship through the Office of Drinking Water. Various advisories can be issued by a Medical Officer of Health in cases where there is a confirmed or suspected water quality problem. Boil Water Advisories are issued when there is potential contamination by bacteria or micro-organisms and water must be boiled for one minute or disinfected in order to eliminate the contaminant. Drinking Water Avoidance Advisories are issued when there is contamination that cannot be killed or removed by boiling the water. Water Quality Advisories are issued when there is a low risk to human health and measures other than boiling can be used to reduce risk.

There are no advisories for public water systems within the Planning District at the time of this report. However, there is one Boil Water Advisory for the semi-public system at SilverFox Place in the RM of East St. Paul that has been in effect since May of 2002. There is one area-wide Boil Water Advisory for the private wells in East Selkirk in the RM of St. Clements.

The following Provincial legislation regulates all aspects of surface and groundwater in Manitoba:

- The Drinking Water Safety Act
- The Water Rights Act
- The Environment Act
- The Public Health Act
- Ground Water and Water Well Act
- Water Protection Act

- The Drinking Water Quality Standards Regulation
- The Drinking Water Safety Regulation
- The Water and Wastewater Facility Operators Regulation

The Manitoba Water Services Board assists rural residents outside Winnipeg in developing safe and sustainable water and/or sewerage facilities. The Board's primary objectives are to ensure that public health and/or environmental concerns are alleviated; and to ensure the sustainability of rural communities. Fulfillment of these objectives will support and promote sustainable community development activities.

The Manitoba Water Services Board provides technical and financial assistance to municipalities and water co-operatives to:

- Obtain, develop, distribute and control water supplies.
- Collect, treat and dispose of municipal sewage in a manner consistent with environmental sustainability.

The RRPD Development Plan guides land use and future development for the member municipalities in the Planning District. Part 4 of the Development Plan outlines objectives and policies to address various land use planning issues. There are two policies relating specifically to development and the provision of drinking water:

- Densification of residential development in Settlement Centres and General Development Areas where appropriate services can be provided will be encouraged to make the provision of sewer and water services increasingly fiscally feasible.
- No new zoning for new development will be permitted within the General Development, Settlement Centre and adjoining Rural Residential areas until secondary plans and plans for improved municipal infrastructure and services, including sewer and/or water, have been prepared.

These policies are intended to ensure future developments are coordinated with expanded and more efficient water and wastewater infrastructure in compliance with the above legislation and regulations. This Drinking Water Plan provides further policy direction in conjunction with the Development Plan and subsequent Secondary Plans.

2.2 Water Withdrawal Volumes

As noted in Section 1.2, the total current annual groundwater demand for domestic purposes based on the 2011 population for the six RRPD municipalities and assuming an average daily consumption of 300L per person is 5.1 million m^3 (population x 300 L x 365 days).

Manitoba's Department of Conservation and Water Stewardship provides water allocations under the *Water Rights Act* for public and semi-public systems, commercial, industrial and agricultural uses. The Department does not license private water systems meaning these withdrawal volumes are not monitored or recorded in a Provincial database. Section 2.4 provides additional detail regarding current licenses.

Figure 3 shows the proportion of the RRPD population that is connected to municipal water versus private wells.

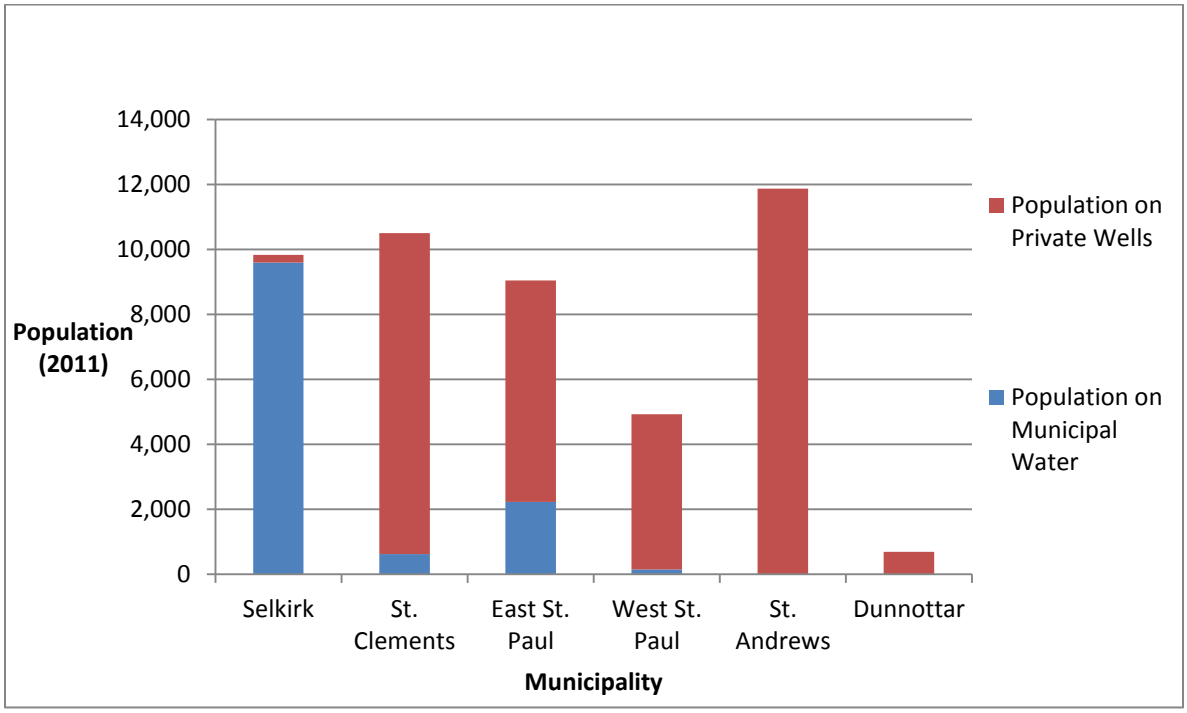


Figure 3: Proportion of RRPD Population Using Municipal vs Private Water

Figure 3 illustrates three significant conclusions about domestic groundwater access throughout the Planning District:

- 73% of the RRPD population currently uses private water wells.
- Excluding City of Selkirk, 92% of the RRPD population uses private wells.
- 98% of City of Selkirk is connected to piped municipal water.

The six municipalities of the RRPD are approved through water rights licenses to withdraw 3.7 million m^3 of water annually. The total current annual groundwater demand of 5.1 m^3 million (based on 2011 population data for the six RRPD municipalities) exceeds the withdrawal volume of 3.7 million m^3 by 38% (Table 2.1).

Table 2.1: Municipal Water Rights License Volumes in the Planning District

Name	*Location*	*Use*	*Annual Volume (dam3)**
RM of East St. Paul	101 Outer Two Mile Lot, St. Paul	Municipal	612
RM of East St. Paul	70 River Lot, St. Paul	Municipal	700
River Creek Estates	164 River Lot, St. Andrews	Municipal	25.0
City of Selkirk	52 River Lot, Selkirk	Municipal	2160
RM of St. Clements		Municipal	199
RM of West St. Paul	35 River Lot, St. Paul	Municipal	25.0
Total Annual Withdrawal Volume (dam3)			**3,721**

* dam^3 = 1000 m^3 Data Source: Manitoba Conservation and Water Stewardship

As the population of the RRPD increases, the total domestic water demand is projected to increase as well. By 2033, it is estimated that domestic water demand based on population projections will exceed current domestic licensing volumes by 75.7%. This discrepancy results from the significant proportion of domestic water withdrawn from private wells, which are not accounted for in terms of water withdrawal.

Due to the lack of data on water withdrawal, municipalities and the Province will need to study the groundwater supply to ensure adequate volumes are available to meet future demand. Future water supply in areas of residential subdivision or infill densification may need to be provided through piped systems and licensed under the Water Rights Act by Manitoba Conservation for a maximum annual allowable withdrawal volume. This will ensure that the water volume is recorded and can be monitored through metering.

The RRPD Development Plan and Secondary Plans should require municipalities and developers to complete a water study prior to the approval of any residential subdivision or infill development. The study should include projections on water demand and input from Manitoba Conservation and Water Stewardship on the cumulative effect on the aquifer, specific to the proposed development. The intention is to have a basic water supply and demand study for each development that can be reported to Manitoba Conservation in order to monitor water withdrawal from the aquifer. This may or may not lead to a Water Rights License application

and establishment of a piped public water system for a development. Where licensing does not occur, the annual water demand from a new development can still be monitored by Manitoba Conservation through household population figures and standard water consumption data. Manitoba Conservation can use this data to track withdrawals from the aquifer and guide future water allocation decisions.

It is critically important that Municipalities understand whether the aquifer can provide enough water to sustain additional development particularly in areas of the Planning District where intensified development is proposed or occurring.

As part of the data collection process, existing infrastructure and planning studies were reviewed in the context of drinking water supply and distribution. Information sources included municipal budgets and presentations, water supply feasibility studies, interviews with Provincial staff and meetings with municipal representatives.

2.3 Water Source, Quality and Protection

Groundwater and surface water provide potential sources of drinking water within the Planning District. The Upper Carbonate Aquifer is the groundwater source that underlies the Planning District and an estimated 20,000 wells in southern Manitoba withdraw water from the aquifer for a variety of uses including agricultural, commercial, rural residential and industrial (Betcher, 1997). Figure 4 shows the location and general flow pattern of the aquifer.

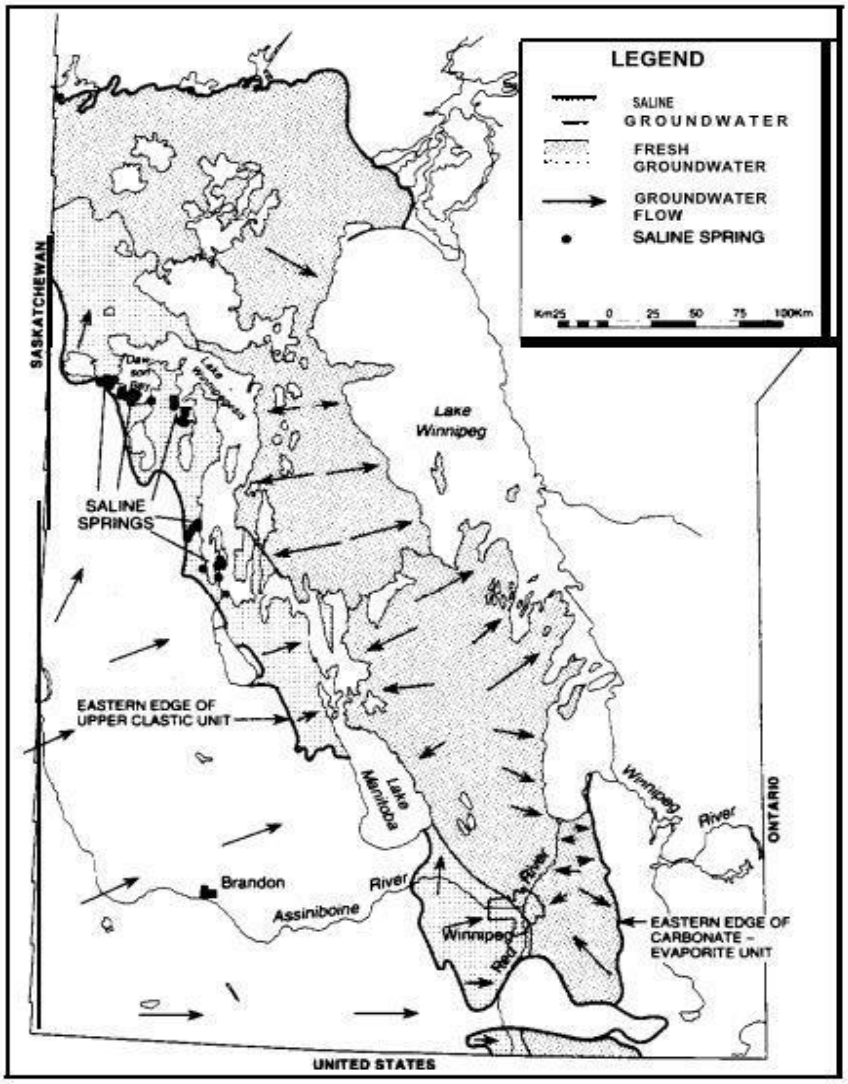


Figure 4: Upper Carbonate Aquifer Location and Flow Pattern

Environment Canada (1995)

Regionally, groundwater quality in the upper carbonate rock aquifer is generally good to excellent and is considered to be hard water based on chemistry. Betcher (1997) demonstrated that groundwater quality over the Interlake region shows a number of fairly distinct geochemical types with defined spatial trends. Fairly hardwater with total dissolved solids (TDS) ranging between 350 and 550 mg/L dominate the central part of the area, stretching from the outskirts of Winnipeg northward to encompass most of the area. The good quality groundwater identified in the central part of the Interlake is bordered on the southwest and southeast by zones of more saline groundwaters (generally TDS is > 800 mg/L). The southeast portion of the upper carbonated aquifer groundwater geochemically becomes complex to the west of the Red River, where TDS approaches 2000 mg/L. Water quality to the east of the Red River is much better

quality (Betcher, 1997). A groundwater quality map from the Province of Manitoba for the RRPD area is provided in Appendix A (Map 6).

There is potential for contamination of the carbonate aquifer in areas where overburden is shallow (i.e., less than 6 m). Groundwater protection is important as more people populate the region along with residential, intensive agricultural operations and industrial developments. Abandoned private wells for domestic and agricultural use can act as conduits where surface contamination can enter the groundwater. The East Interlake Conservation District has produced a watershed management plan that identifies protection activities for the Netley-Grassmere watershed. Particular attention in the plan is focused on the proximity of public drinking water systems to developments/uses such as:

- Chemical and fertilizer application and storage
- Bulk fuel storage
- Waste disposal grounds
- Wastewater lagoons
- Transportation of dangerous goods
- Intensive livestock operation

Surface water sources are located throughout the Planning District as shown on Map 3. The smaller creeks and rivers have varying levels of surface water depending on seasonal precipitation changes and climatic factors. Surface and groundwater for drinking water are subject to treatment through chemical and physical processes, depending on the source. Centralized water treatment facilities provide safe drinking water through treatment methods including aeration, coagulation, sedimentation, filtration and disinfection.

Surface water sources used for drinking water include Netley Creek, the Red River, and Devil's Creek.

The northwest portion of the RM of West St. Paul is within the Rockwood Sensitive Area. This area is specifically regulated by Manitoba Conservation and Water Stewardship due to groundwater contamination from historical industrial activity. There are regulations for drilling groundwater wells in the area as shown on Map 5 and special authorization is required from Manitoba Conservation and Water Stewardship for any wells drilled within this area.

2.4 Current Water Infrastructure and Demand

Public and semi-public groundwater wells for all uses including drinking water supply from the carbonate aquifer in the Planning District are shown in Maps 1 and 2. These sites have licensed water withdrawals under the Drinking Water Safety Act. Municipal drinking water sources are licensed for specific withdrawal volumes and the systems are monitored by municipal staff whereas private domestic water supply is provided by on-site wells that serve individual properties.

The Drinking Water Safety Act classifies drinking water systems in Manitoba into three categories for regulatory and monitoring purposes:

1) Public water systems are licensed under the Water Rights Act, have 15 or more service connections, or have been designated a public water system. Components include wells, reservoirs, treatment plants, distribution piping and flow meters.

2) Semi-public water systems are not public water systems or private water systems and include small systems with less than 15 service connections or a public facility such as a school or hospital with its own water supply. These systems may have a Water Rights License if a disinfection process is part of the system.

3) Private systems supply water to only one private residence, or those which have been designated as such.

There are also non-potable water systems that provide water to permanent dwellings for non-potable purposes.

Manitoba's Guide to Drinking Water Plans states the average daily water consumption is 300 L per person. Manitoba Conservation and Water Stewardship monitors the licensed water volumes and assesses any new withdrawal applications for industrial, commercial, agricultural or domestic purposes within the RRPD. Water volume and use allocations must be balanced to ensure the sustainability and safety of the groundwater supply and public systems must have a Water Rights License that regulates the annual amount of water withdrawal.

There are 38 Water Rights Licenses approved or in the approval process within the RRPD area including 6 for surface water, 33 for groundwater including 8 licenses designated for municipal purposes for RRPD municipalities in Table 2.2. These licences authorize an annual maximum withdrawal volume for the stated purpose on each licence. Mapping the distribution network for semi-public and public water systems for the RRPD is an extensive undertaking and beyond the scope of this study. Maps 1 and 2 show the license locations.

The total annual licensed water withdrawal volume for all uses in the RRPD is **8.6 million cubic meters (m^3)**.

Table 2.2: Water Rights License Volumes in the Planning District

Name	Source	Location	Use	Annual Volume (dam3)*
3839941 Manitoba Ltd.		47 River Lot, St. Clements	Other	219
Amsco Cast Products Inc.		27 River Lot, St. Clements	Industrial	10.4
Bannister's Dairy Inc.		120 River Lot, St. Andrews	Agricultural	10
Conservation, Manitoba		NW-34-017-04-E-	Municipal	16.0
Dalman, Arthur Bruce	Netley Creek	NW-28-015-04-E-	Irrigation	86.35
RM of East St. Paul		101 Outer Two Mile Lot, St. Paul	Municipal	612
RM of East St. Paul		70 River Lot, St. Paul	Municipal	700
Gerdau Ameristeel Corporation		28 River Lot, St. Clements	Industrial	84
Gerdau Ameristeel Corporation	Wells	28 River Lot, St. Clements	Industrial	1700
Highway Gardens Ltd.	Well	77 River Lot, St. Andrews	Municipal	30
Imperial Oil Limited	Red River	101 River Lot, St. Paul	Other	200
Keaschell Parks Ltd.	Well	272 River Lot, St. Andrews	Municipal	131
Keystone Pig Advancement Inc.		NW-20-016-04-E-	Agricultural	13.3
Larter's at St. Andrews Golf and Country Club	Red River	9 River Lot, St. Andrews	Irrigation	59
Lord Selkirk School Division	Well	105 River Lot, St. Andrews	Other	29.5
Lord Selkirk School Division	Well	75 River Lot, St. Clements	Other	115
Manitoba Hydro		73 River Lot, St. Clements	Industrial	494
Meadows at East St. Paul Golf Course, The		113 Outer Two Mile Lot, St. Paul	Irrigation	98.68
Netley Holding Co. Ltd.		SW-5-16-4-E-	Other	119.37
Palaschuk, Peter	4 Wells	SW-04-013-06-E-	Agricultural	247
Petaski, Ronald Michael	Devils Creek	SE-06-015-06-E-	Irrigation	37
River Creek Estates		164 River Lot, St. Andrews	Municipal	25.0
River East Transcona School Division	Well	98 River Lot, St. Paul	Other	150
Searle Greenhouses Ltd.		78 River Lot, St. Clements	Irrigation	
Selkirk Redi-Mix Ltd.		156 River Lot, St. Andrews	Industrial	Cancelled

Name	Source	Location	Use	Annual Volume (dam3)*
City of Selkirk		67 River Lot, Selkirk	Other	599
City of Selkirk	Wells	52 River Lot, Selkirk	Municipal	2160
Shearer, Robert Henry	Devils Creek	NW-06-015-06-E-	Irrigation	56
RM of St. Clements			Municipal	199
Van Aert Farms		SE-24-013-05-E-	Agricultural	13.32
Van Schepdael, Joe		SW-23-014-06-E-	Other	18
RM of West St. Paul		18 River Lot, St. Paul	Other	2.47
RM of West St. Paul		11 River Lot, St. Pauls	Other	199
RM of West St. Paul		35 River Lot, St. Paul	Municipal	25.0
Town of Winnipeg Beach		SE-33-017-04-E-	Municipal	50.0
Winnipeg Regional Health Authority		62 River Lot, St. Clements	Other	130
Total Annual Withdrawal Volume (dam3)				**8,638**

* $dam^3 = 1000\ m^3$ Data Source: Manitoba Conservation and Water Stewardship

From the total licensed volume of 8.6 million m^3, 3.7 million m^3 is licensed for municipal uses including drinking water. The actual water demand is directly related to the total population of the RRPD. There are currently 12,603 people connected to municipal water in the RRPD. As shown in Table 2.3, this accounts for a total annual domestic withdrawal of 1.3 million m^3 (12,603 x 300L x 365 days) or 38% of the current annual licensed volume of 3.6 million m^3. This suggests that significantly more water volume could be withdrawn (i.e. population added) to the currently licensed systems. However, as previously noted, private systems are not factored in to the total withdrawal volumes.

Table 2.3: Comparison of Licensed and Actual Annual Municipal Water Withdrawals

Municipality	Current Annual Licensed Volume (m3)	2011 Population Connected to Municipal Water	2011 Annual Withdrawal (m3) from Licensed Systems *
Selkirk	2,160,000	9,594	1,050,543
St. Clements	199,000	624	68,328
East St. Paul	1,312,000	2,229	244,075
West St. Paul	25,000	156	17,082
St. Andrews	0	0	0
Dunnottar	0	0	0
Total	**3,696,000**	**12,603**	**1,380,028**

* annual withdrawal is population x 300L x 365 days / 1000

Actual domestic water use on municipal systems can be measured through flow meters for billing purposes and to establish common use rates. For this report, the daily consumption of 300L per person is used for consistency in projecting future demand in the Planning District.

Groundwater Management and Groundwater Licensing does not establish or license private on-site domestic water wells and does not record withdrawal volumes. For this report, the number of people using water from private on-site systems in the RRPD is estimated at 34,285 with a total annual withdrawal volume of 3.7 million m^3 as shown in Table 2.4.

In summary, the current estimated total annual domestic water withdrawal from public (1.4 million ^{m3}) and private systems (3.7 million m^3) in the RRPD is 5.1 million m^3. This volume is 38% higher than the 3.7 million m^3 currently licensed for municipal use.

Table 2.4: Estimated Annual Water Withdrawal from Private Systems

Municipality	2011 Total Population	2011 Population Connected to Municipal System	2011 Estimated Population Using Private On-site System	2011 Estimated Annual Withdrawal from On-site Systems (m^3)
Selkirk	9,834	9,594	240	26,280
St. Clements	10,505	624	9,881	1,081,969
East St. Paul	9,046	2,229	6,817	746,461
West St. Paul	4,932	156	4,776	522,972
St. Andrews	11,875	0	11,875	1,300,312
Dunnottar	696	0	696	76,212
Total	**46,888**	**12,603**	**34,285**	**3,754,206**

Further impacting the understanding of total water withdrawal volumes, there are 36 semi-public systems in the RRPD that provide drinking water supply and distribution to occupants within a facility. These systems are exempt from licensing annual maximum withdrawal under the Domestic Use Exemption of the Water Rights Act except where disinfection process is installed. The Office of Drinking Water uses a risk-based approach to monitor compliance with The Drinking Water Safety Act with priority on high-risk facilities such as hospitals, personal care homes, commercially licensed daycares and schools. Secondary efforts are used for more moderate-risk facilities including recreational camps, restaurants and food handling establishments and remote lodges.

Table 2.5 lists the inventory of semi-public water systems within the Planning District.

Table 2.5: Identified Semi-Public Water Systems in the RRPD

System Location	Municipality	Type	Operation
A & W LOCKPORT - SPWS	St. Clements	Food Handling Establishment	Year-Round
BEHAVIORAL HEALTH FOUNDATION - SPWS	St. Andrews	Food Handling Establishment	Year-Round
KENNEDY HOUSE - SPWS	St. Andrews	Food Handling Establishment	Seasonal
DUNNOTTAR ARTESIAN WELLS - SPWS	Dunnottar	Other	Year-Round
59 ER RESTAURANT	St. Clements	Food Handling Establishment	Year-Round
GAFFERS RESTAURANT - SPWS	St. Clements	Food Handling Establishment	Year-Round
GREENWALD COLONY FARMS - SPWS	St. Clements	Hutterite Colony	Year-Round
HALF MOON LOCKPORT - SPWS	St. Clements	Food Handling Establishment	Year-Round
HAPPY PLANET - SPWS (RICKYS ALL DAY GRILL)	St. Andrews	Food Handling Establishment	Year-Round
HERITAGE GOLF COURSE - SPWS	St. Clements	Food Handling Establishment	Year-Round
INTERLAKE COOP NURSERY INC - SPWS	St. Andrews	Day Care	Year-Round
HYLAND PARK - SPWS	East St. Paul	Recreational Camp	Seasonal
LOCKPORT INN - SPWS	St. Clements	Food Handling Establishment	Year-Round
LOCKPORT MOHAWK	St. Andrews	Business / Institution	Year-Round
LOCKPORT SCHOOL	St. Andrews	School	Year-Round
MAPLETON LANE	St. Andrews	Business / Institution	Year-Round
MAPLETON SCHOOL	St. Andrews	School	Year-Round
MIDDLECHURCH HOME OF WINNIPEG	West St. Paul		Year-Round
MIDDLECHURCH ON THE RED	West St. Paul		Year-Round
NETLEY CREEK GOLF COURSE	St. Andrews	Food Handling Establishment	Seasonal
PAPA CARLO PIZZA & GELATI	St. Andrews	Food Handling Establishment	Year-Round
PATRICIA BEACH STANDPIPE	St. Clements	Other	Seasonal
REMBRANDT'S BISTRO	St. Clements	Food Handling Establishment	Year-Round
RIVER CREEK ESTATES	St. Clements	Other	Year-Round
RIVERCREST EARLY LEARNING AND CHILD CARE	West St. Paul	Child Care Facility	
RIVERCREST MOTOR HOTEL	West St. Paul	Food Handling Establishment	Year-Round
ROYAL MANITOBA YACHT CLUB	West St. Paul	Food Handling Establishment	Seasonal
SKINNERS HWY 44	St. Andrews	Food Handling Establishment	Seasonal
SKINNERS RIVER ROAD	St. Andrews	Food Handling Establishment	Seasonal
SPORTSMAN'S STOP	St. Clements	Business / Institution	Year-Round
ST. ANDREWS SCHOOL	St. Andrews	School	Year-Round
SUBWAY LOCKPORT	St. Clements	Food Handling Establishment	Year-Round
SUNOVA CENTRE	West St. Paul	Day Care	Year-Round
WALTER WHYTE SCHOOL	St. Clements	School	Year-Round
WEST ST. PAUL SCHOOL	West St. Paul	School	Year-Round
WILLIAM S. PATTERSON SCHOOL	St. Andrews	School	Year-Round

Source: Manitoba Conservation and Water Stewardship

2.5 Population Trends and Future Water Demand

The population of the RRPD is projected to increase 27.4% by approximately 12,838 people over the next 20 years using updated figures from the 2013 Capital Region Transportation Master Plan (MMM Group, 2013). Table 2.6 shows the projected increase in population and water demand for each municipality between 2011 and 2033.

Table 2.6: Projected Population Changes from 2011 to 2033

Municipality	Population in 2011	Total Annual Groundwater Demand (m3) in 2011	Projected Population in 2033	Projected Total Annual Groundwater Demand (m3) in 2033
East St. Paul	9,046	990,537	11,260	1,232,970
West St. Paul	4,932	540,054	7,730	846,435
St. Andrews	11,875	1,300,312	14,770	1,617,315
Selkirk	9,834	1,076,823	12,200	1,335,900
St. Clements	10,505	1,150,297	13,070	1,431,165
Dunnottar	696	76,212	696	76,212
Total	**46,888**	**5,134,235**	**59,726**	**6,539,997**

Using the above population figures and growth rate, the total current annual demand on the groundwater resource from domestic residential uses within the RRPD is estimated at 5,134,235 m^3 (including public municipal supply and private well systems). This current demand is 38% higher than the current licensed volume. The projected annual demand on groundwater resources based on population projections in 2033 from domestic residential uses within the RRPD is estimated to increase to 6,539,997 m^3 in direct relation to the projected population increase. This means that over the next 20 years, the domestic water demand will surpass the current licensed volumes by 76.9% if no new licenses are issued in that time.

A comprehensive analysis of current groundwater supply and demand, including private wells, is critical for the long-range planning of the region. Both municipalities and the Province have a role to play since the watershed areas cross numerous municipal boundaries.

2.6 Regional Growth and Planning Considerations

The intensification of residential areas and the future establishment of piped wastewater service west of the Red River and north of Winnipeg are key planning considerations for the Planning District. Map 4 shows the general location for future growth and Table 2.7 describes future population growth areas in the district.

The City of Selkirk is currently conducting a study to determine the infrastructure needs that will accommodate future growth particularly in the 500 acre west Selkirk lands adjacent to PTH 9. There is land for development in this area although the current infrastructure does not have the

capacity to accommodate growth. Any future development in this area would require new infrastructure with expanded capacities.

Table 2.7: Potential Future Growth Patterns in the RRPD Municipalities

Municipality	Projected Growth Pattern
East St. Paul	Infill projects in the south portion
West St. Paul	Middlechurch Settlement Centre, West St. Paul north between Main Street and the Red River
St. Andrews	Lockport Settlement Centre, South St. Andrews, St. Andrews Airport
Selkirk	Infill residential and mixed-use development, west Selkirk lands
St. Clements	East Selkirk north, Grand Marais Settlement Centre
Dunnottar	Community is built-out within the municipal boundary

Population growth is expected to occur in these areas and will contribute toward increases in water demand noted in Section 2.5. This growth will require that municipalities and/or development proponents better understand the incremental needs of water to support new development and ensure there is a safe supply in the future. This can be achieved if municipalities require water studies be completed and license applications be submittted for review by Manitoba Conservation and Water Stewardship prior to approving new development in areas where groundwater supply capacity is unknown.

Recently there was opportunity identified to supply water from the City of Winnipeg to one or more neighbouring municipalities within the Capital Region. Extending the system into adjacent municipalities was identified as a potential solution to address the growing servicing demand in the Capital Region. Winnipeg's municipal water is fed via aqueduct from Shoal Lake in Ontario to the City's pumping and distribution system and has provided a stable water supply to the City for over 80 years. The legal authority of Winnipeg to supply water beyond its boundary has been legally challenged in court therefore this option is not currently feasible until the legal issues are resolved.

Municipalities must work with Provincial regulators to ensure there is a sufficient amount of water to accommodate increased withdrawals in areas of RRPD that have population growth. Manitoba Conservation and Water Stewardship should use the RRPD growth projections to monitor the potential cumulative effects of existing and additional surface and groundwater withdrawals during the review of license applications. This will require coordination among the Planning District municipalities, the Province and development proponents to ensure that the scale and timing of projects is consistent with available water supply.

The following drinking water policies provide more specific planning guidance in addition to the Development Plan:

1. The responsibilities of developers, municipalities and Provincial departments should be clearly defined when planning, developing and monitoring future drinking water systems.

2. Each municipality or development proponent should undertake a water supply study conducted by a qualified professional engineer or professional geoscientist to guide future water withdrawals and development decisions. Studies conducted in an area with an adopted watershed management plan should reference that plan.

3. Where there is intensified development and Development Plan policies encouraging densification, municipalities and/or development proponents should establish piped centralized public water systems with a sustainable water source.

4. Municipalities with piped wastewater systems should monitor water usage with meters to determine volumes being discharged into the wastewater system.

5. When submitting development applications, proponents should work with Provincial regulators and/or municipalities to complete groundwater supply and quality studies.

6. The Planning District should consider coordinating future water supply projects through a regional technical body to make efficient use of funding and provide consistency in servicing new developments.

7. Property owners connecting to public water and wastewater systems should decommission private domestic wells to eliminate potential pollution points for surface contamination. This will allow for accurate metering of water provided from a piped system that is discharged into a municipal sewer.

8. Drinking water within the Rockwood Sensitive Area should be provided from a safe source through a piped distribution system. Significant development should not be considered until a safe water source is established.

3.0 CITY OF SELKIRK

3.1 Current Water Supply, Infrastructure and Cost

Selkirk's municipal drinking water supply is from four groundwater wells located within the city. Three wells draw water from a deep carbonate aquifer and one well draws from a shallower portion of the aquifer. The wells have an annual withdrawal volume 2,160,000 m^3 as per the Water Rights License issued by Manitoba Conservation and Water Stewardship. The source water is typically high in hardness and dissolved solids and dissolved chlorides. The Red River is a surface water source available to the City and has been used as part of the municipal system in the past. The river is not currently used as a drinking water source.

The City operates a piped supply and distribution system that provides drinking water to all properties within the city limit. Source water is treated at the Selkirk Water Treatment Plant (WTP) before entering the distribution system. The piped network consists of 41.6 km of cement pipe, 12.3 km of polyvinyl chloride pipe and 6.7 km of cast iron pipe. As of November 2013 there are 3,286 connections to the municipal system. Selkirk has a service agreement and provides piped water service to the Mapleton Lanes Condominium in the R.M. of St. Andrews.

Water is routinely tested to ensure safety and to monitor the performance of the treatment facility. Test locations are at the WTP and at various locations within the distribution system. All water test results associated with water safety are submitted to the Provincial Office of Drinking Water for review. The most recent data from 2013 shows performance of the system has been 100% compliant with regulatory criteria for bacterial and disinfection treatment.

The current municipal operating budget of the drinking water system is $1.1 million and is funded entirely through fees paid by users connected to the system.

Capital expenditures in 2012 were for the water treatment facility expansion and upgrade at an estimated cost of $9,708,110 including engineering. Total capital expenditures identified for 2013 were $4.7 million including:

- Valve replacement inside Water Plant.
- Exterior painting of the Water Tower.
- New 2 million litre reservoir and piping at Water Treatment Facility.
- Clarifier replacement.
- Water main upgrades and replacements.
- Sourcing and testing of 2 new 10” wells.
- Installation of pipeline from well to Water Treatment Facility.

Gerdau Ameristeel is a large industrial site in Selkirk that has a Water Rights license annual withdrawal volume of 1,784,000 m^3 for industrial use.

3.2 Water Demand and Use

City of Selkirk’s population is 9,834 according to the 2011 census. There are 3,286 water service connections to the municipal system according to information from the City’s Public Works Department. The most recent data from 2013 shows a production volume of the

municipal system is 4.5 million liters per day, or 1,642,500 m3 per year based upon the metering data from the City's Public Works Department.

For this report, an average daily consumption of 300 L per person is used for consistency in planning within the RRPD. The annual water demand based on this figure is 1.076,823 m^3.

3.3 Projected Growth Rates and Development Pattern

Selkirk's population is projected to increase from 9,843 in 2011 to 12,200 in 2033. The City is supporting increased densities and infill development that will create efficiencies in the current drinking water system. The economic benefits of infill development include increased revenues from existing infrastructure, increases in land value and higher densities to support local businesses.

3.4 Future Water Supply and Demand

Selkirk's water supply can accommodate future growth based on population growth estimates and the availability of licensed groundwater. The current maximum annual withdrawal volume under license conditions is 2,160,000 m^3 and the future projected annual water demand in 2033 is 1,335,900 as shown in Table 3.1.

Table 3.1: Future Population and Annual Water Demand in Selkirk

Municipality	Population in 2011	Total Annual Groundwater Demand (m3) in 2011	Projected Population in 2033	Projected Total Annual Groundwater Demand (m3) in 2033
Selkirk	9,834	1,076,823	12,200	1,335,900

3.5 Regional Growth and Planning Considerations

There is currently no change required in the type or function of the City's water system to meet future demand. Future extension of the water system will occur in conjunction with wastewater service expansions and other related development infrastructure to service new developments within the city and will be funded through contributions as specified in development agreements.

Selkirk currently has a service agreement with the RM of St. Andrews to provide water from Selkirk to the Mapleton Lanes condominium and there is potential to provide further water service extension into the municipality., This could occur with the extension of wastewater services into the RM of St. Andrews between PTH 44 and the southern City limit based upon three factors:

- Selkirk's has the capacity to handle increased water in its public system.

- St. Andrews requires a coordinated approach that will address water supply by providing drinking water through the Provincial licensing process.
- There is an existing service arrangement between Selkirk and St. Andrews that can be used as a tested model.

4.0 RM OF ST. ANDREWS

4.1 Current Water Supply, Infrastructure and Cost

There are currently no public drinking water systems operated by the RM of St. Andrews. There is one system licensed for 25,000 m^3 and there are 14 semi-public water systems in the municipality as shown on Table 4.1. Residential properties use private systems to access groundwater from wells for household water on each individual property. These systems are independent and not connected to any other property. The water in St. Andrews is good quality; it is not mineralized or hard.

Individual property owners are responsible for all costs associated with their domestic water supply systems. The municipality currently has no financial involvement in providing drinking water to individual properties.

Table 4.1: Semi-Public Water Systems in St. Andrews

System Location	Municipality	Type	Operation
BEHAVIORAL HEALTH FOUNDATION - SPWS	St. Andrews	Food Handling Establishment	Year-Round
KENNEDY HOUSE - SPWS	St. Andrews	Food Handling Establishment	Seasonal
HAPPY PLANET - SPWS (RICKYS ALL DAY GRILL)	St. Andrews	Food Handling Establishment	Year-Round
INTERLAKE COOP NURSERY INC - SPWS	St. Andrews	Day Care	Year-Round
LOCKPORT MOHAWK	St. Andrews	Business / Institution	Year-Round
LOCKPORT SCHOOL	St. Andrews	School	Year-Round
MAPLETON LANE	St. Andrews	Business / Institution	Year-Round
MAPLETON SCHOOL	St. Andrews	School	Year-Round
NETLEY CREEK GOLF COURSE	St. Andrews	Food Handling Establishment	Seasonal
PAPA CARLO PIZZA & GELATI	St. Andrews	Food Handling Establishment	Year-Round
SKINNERS HWY 44	St. Andrews	Food Handling Establishment	Seasonal
SKINNERS RIVER ROAD	St. Andrews	Food Handling Establishment	Seasonal
ST. ANDREWS SCHOOL	St. Andrews	School	Year-Round
WILLIAM S. PATTERSON SCHOOL	St. Andrews	School	Year-Round

Source: Manitoba Conservation and Water Stewardship

Should the municipality pursue a public system in the future, components may include groundwater wells, surface water intake, reservoir, pumps, treatment plant and distribution piping. Water volume is typically metered at the receiving connection and reported back to the municipality for billing purposes. The cost of such a system cannot be determined until a schematic plan is in place.

The municipality may direct that a new subdivision or infill intensification development incorporate a public water system with a Water Rights License that will address groundwater supply concerns.

4.2 Water Demand and Use

Current water demand in the municipality is from existing residential, commercial and institutional users. Annual domestic residential water demand is estimated at 1,300,312 m^3 based on the current population shown in Table 4.2.

Table 4.2: Current Estimated Annual Domestic Water Demand

Year	Population	Average Daily Volume/Person (m^3)	Estimated Annual Domestic Water Demand (m^3)
2011	11,875	0.30	1,300,312

4.3 Projected Growth Rates and Development Pattern

The population in the R.M. of St. Andrews is projected to increase from 11,875 in 2011 to 14,770 in 2033 and the general growth pattern is shown on Map 4. There is increased pressure for development in the southern portion of the R.M. of St. Andrews for individuals who enjoy a rural lifestyle but would like to live within a commutable distance from Winnipeg or Selkirk.

There is also the potential for piped wastewater to extend into South St. Andrews in the next 5 years as part of future phases of the trunk sewer project in West St. Paul. This will attract new development and increased residential densities that will require a sustainable drinking water supply. The municipality will need to work with developers to initiate Water Rights License applications for public systems that will trigger a review by Manitoba Conservation and Water Stewardship. This will ensure that only licensed groundwater volumes are accessed to ensure sustainability of the aquifer as development proceeds.

The Lockport Settlement Centre Secondary Plan and the Draft South St. Andrews Secondary Plan guide land use and development within the southern area of the R.M. of St. Andrews. The two secondary plans allow for existing residential areas to intensify in consideration of future municipal wastewater servicing.

The St. Andrews Airport and area is located in the southern region of the municipality and is identified as "Business Park" in the Development Plan. Part of the existing development is located on airport lands and other industrial development is located just outside the airport boundaries in the St. Andrews Industrial Park. Approximately 142 acres of additional land just south of PTH 27 was recently re-designated from "Agriculture" to "Business Park" and is considered an integral part of the St. Andrews Airport and Area Secondary Plan study area. This land is seeing interest for future commercial and light industrial development and is anticipated to be fully-built out in approximately five to ten years. The groundwater is not potable in this area and requires access to a treated supply and piped distribution system.

Residential development in the northern region of the R.M. of St. Andrews is scattered with concentrations of dwellings in the "Resource and Agriculture" designation. The communities of Petersfield and Clandeboye are the primary "Settlement Centres" with the majority of development situated along the waterfront in Petersfield. There is an abundance of land designated for future "Settlement Centre" in Petersfield, but the majority of this land is not waterfront and the demand for non-waterfront cottage lots is low.

4.4 Future Water Supply and Demand

Groundwater from the carbonate aquifer and surface water from the Red River are available drinking water supply sources for the municipality. Water sources for private individual wells do not require licensing through Manitoba Conservation and Water Stewardship therefore there is no way to monitor the cumulative impact that growth has on the water supply. Future domestic water demand is estimated to increase by 24.4% using population figures shown in Table 4.3.

Table 4.3: Future Population and Annual Water Demand in St. Andrews

Municipality	Population in 2011	Total Annual Groundwater Demand (m3) in 2011	Projected Population in 2033	Projected Total Annual Groundwater Demand (m3) in 2033
St. Andrews	11,875	1,300,312	14,770	1,617,315

Since none of the domestic water demand is currently licensed in St. Andrews, there is a need to study the groundwater supply before new development or intensification is considered. This may lead to Water Rights license application to support public water systems with sustainable volumes.

4.5 Regional Growth and Planning Considerations

Subdivision development projects should be required to provide proof of a safe and sustainable water supply before establishing a public water system with an associated Water Rights license to determine appropriate withdrawal volumes. The systems would service a dedicated number

of properties within a development and would consist of similar infrastructure as noted in Section 4.1 above. Developers would be responsible for capital costs of the public system and ongoing operating costs would be funded by users on the system.

St. Andrews has a service sharing agreement with the City of Selkirk that provides drinking water from Selkirk's system to the Mapleton Lane condominium. This service could be expanded further south into St. Andrews to meet future demand in the Lockport Settlement Centre.

Establishment of piped water systems should occur in conjunction with piped wastewater service in the district. A similar water sharing agreement could be implemented in south St. Andrews with the R.M. of West St. Paul in conjunction with future extension of the trunk sewer system. Water and wastewater systems should be designed for phased extensions to accommodate future growth as communities build-out and/or intensify through infill development.

The most common funding formula for implementing municipal water systems is a combination of a Local Improvement District (LID), grant funding through Provincial and/or Federal government and user fees at each service connection. Recently municipalities have accessed capital funds from the Federal Gas Tax Fund to support public infrastructure projects that achieve positive environmental results.

5.0 RM OF ST.CLEMENTS

5.1 Current Water Supply, Infrastructure and Cost

A municipal piped drinking water system has been developed to serve 260 dwellings in East Selkirk. The system consists of a well, treatment plant and distribution piping. The water system has a lot of capacity to accommodate growth in East Selkirk. The municipal operating budget of the drinking water system is expected to be $250,000 funded entirely through fees paid by users connected to the system. The total capital cost provided for this report included both the wastewater and drinking water components of the East Selkirk municipal system. The total cost $13.1 million and was split 31% grants, 30% LID, 26 % gas tax funds and 13% utility. Costs associated with private and semi-public systems are the responsibility of the property owner.

East Selkirk's wells are 200 feet deep into the lower aquifer. Water is pumped at 15 to 20 litres per second through the plant, which is more than double the average day demand. The water treatment plant has an in-ground treated water reservoir for firefighting and diurnal peaks. The water in the area is extremely mineralized. The water is chlorinated at the treatment plant and most homes have on-line water softeners. There are plans to soften the water at the water plant in the future.

This East Selkirk area was identified as a priority area within the R.M. of St. Clements in 2001 when approximately 60 residences received public health orders from the Province of Manitoba as a result of contaminated water due to failing septic systems. The Health Officer stated that these health orders would not be lifted until East Selkirk established a municipal water and waste treatment system.

All other areas within the RM are serviced by private on-site water systems or one of the 13 semi-public systems as shown in Table 5.1.

Table 5.1 Semi-Public Water Systems in St. Clements

System Location	Municipality	Type	Operation
A & W LOCKPORT - SPWS	St. Clements	Food Handling Establishment	Year-Round
59 ER RESTAURANT	St. Clements	Food Handling Establishment	Year-Round
GAFFERS RESTAURANT - SPWS	St. Clements	Food Handling Establishment	Year-Round
GREENWALD COLONY FARMS - SPWS	St. Clements	Hutterite Colony	Year-Round
HALF MOON LOCKPORT - SPWS	St. Clements	Food Handling Establishment	Year-Round
HERITAGE GOLF COURSE - SPWS	St. Clements	Food Handling Establishment	Year-Round
LOCKPORT INN - SPWS	St. Clements	Food Handling Establishment	Year-Round
PATRICIA BEACH STANDPIPE	St. Clements	Other	Seasonal
REMBRANDT'S BISTRO	St. Clements	Food Handling Establishment	Year-Round
RIVER CREEK ESTATES	St. Clements	Other	Year-Round
SPORTSMAN'S STOP	St. Clements	Business / Institution	Year-Round
SUBWAY LOCKPORT	St. Clements	Food Handling Establishment	Year-Round
WALTER WHYTE SCHOOL	St. Clements	School	Year-Round

Source: Manitoba Conservation and Water Stewardship

5.2 Water Demand and Use

Current total water demand is from existing residential, commercial and institutional users within the municipality. Annual domestic residential water demand is estimated at 1,150,297 m^3 based on the following data in Table 5.2.

Table 5.2: Current Estimated Annual Domestic Water Demand

Year	Population	Average Daily Volume/Person (m3)	Estimated Annual Domestic Water Demand (m3)
2011	10,505	0.30	1,150,297

5.3 Projected Growth Rates and Development Pattern

A 166-lot subdivision is in development in the Grand Marias Settlement Centre. The development may include seasonal and permanent residences, affordable multi-family housing for seniors and retail commercial within the existing community of Grand Marais. The Grand Marais Secondary Plan will direct all future commercial development to the existing commercial area in Grand Marais with the intent of creating a lively and interactive "town centre".

There is potential for St. Clements to develop piped service to receive wastewater from Grand Beach Provincial Park. This partnership could also extend to drinking water service for the densely developed areas in Grand Marais and inside the Provincial Park. A common funding formula for establishing municipal water systems is a combination of a Local Improvement District (LID), grant funding through Provincial and/or Federal government and user fees at each service connection. Water volume is typically metered at the receiving connection and reported back to the municipality for billing purposes. There have been no specific proposals for a public system in this area however the common components may include groundwater wells, surface water intake, reservoir, treatment plant, pumps and distribution piping.

There is potential for expanded residential development in East Selkirk northeast of PTH 59 and north of PTH 44 according to the 2012 Wastewater Beta-test Report (MMM Group 2012). A maximum of up to 200 residential lots could be developed in this area over the next ten years. The southern area of the municipality also has potential for an additional 420 new dwellings. Development in this part of the municipality is heavily restricted due to the fact that septic fields are no longer permitted in the Red River Corridor Designated Area and the Lockport Sewage Treatment Plant is nearing capacity. The establishment of piped wastewater service may serve as a catalyst for development and should require piped drinking water be implemented due to the failing septic fields in this area.

5.4 Future Water Supply and Demand

Groundwater from the carbonate aquifer and surface water from the Red River are available drinking water supply sources for the municipality. Access to groundwater for private individual wells does not require licensing through Manitoba Conservation and Water Stewardship therefore there is no way to monitor the cumulative impact that growth has on the water supply. Future domestic water demand is estimated to increase by 24.4% using population figures shown in Table 5.3.

Table 5.3: Future Population and Annual Water Demand in St. Clements

Municipality	Population in 2011	Total Annual Groundwater Demand (m3) in 2011	Projected Population in 2033	Projected Total Annual Groundwater Demand (m3) in 2033
St. Clements	10,505	1,150,297	13,070	1,431,165

The future demand in the municipality exceeds the current licensed volume and should be managed through Water Rights Licensing and piped drinking water systems in the growth areas. The municipality should work with developers to initiate the licensing process and trigger a review by Manitoba Conservation and Water Stewardship to ensure the aquifer can sustain development. The cost of such a system cannot be determined until a schematic plan is in place.

5.5 Regional Growth and Planning Considerations

There is potential for regional infrastructure sharing between Grand Marais and Grand Beach Provincial Park. Grand Marais is immediately adjacent to the park and there is potential for a regional approach to water and wastewater infrastructure to serve the densely populated areas. The first component of this plan would be an agreement to install wastewater piping from Grand Beach to the Grand Marais wastewater lagoon. This agreement could be a catalyst for discussions to include shared drinking water in a regional infrastructure system. There have been no capital funding proposals for this arrangement although a likely model would include municipal, provincial and possibly a federal contribution. Developers would be responsible for capital costs to connect to the system and ongoing operating costs would be funded by fees from users.

6.0 RM OF EAST ST. PAUL

6.1 Current Water Supply, Infrastructure and Cost

Water supply in the East St. Paul consists of public, private and semi-public systems that access groundwater through wells. There are 929 connections to the public municipal system which consists of a water treatment plant, reservoir complex, six wells and a piped distribution network as shown on Figure 5.

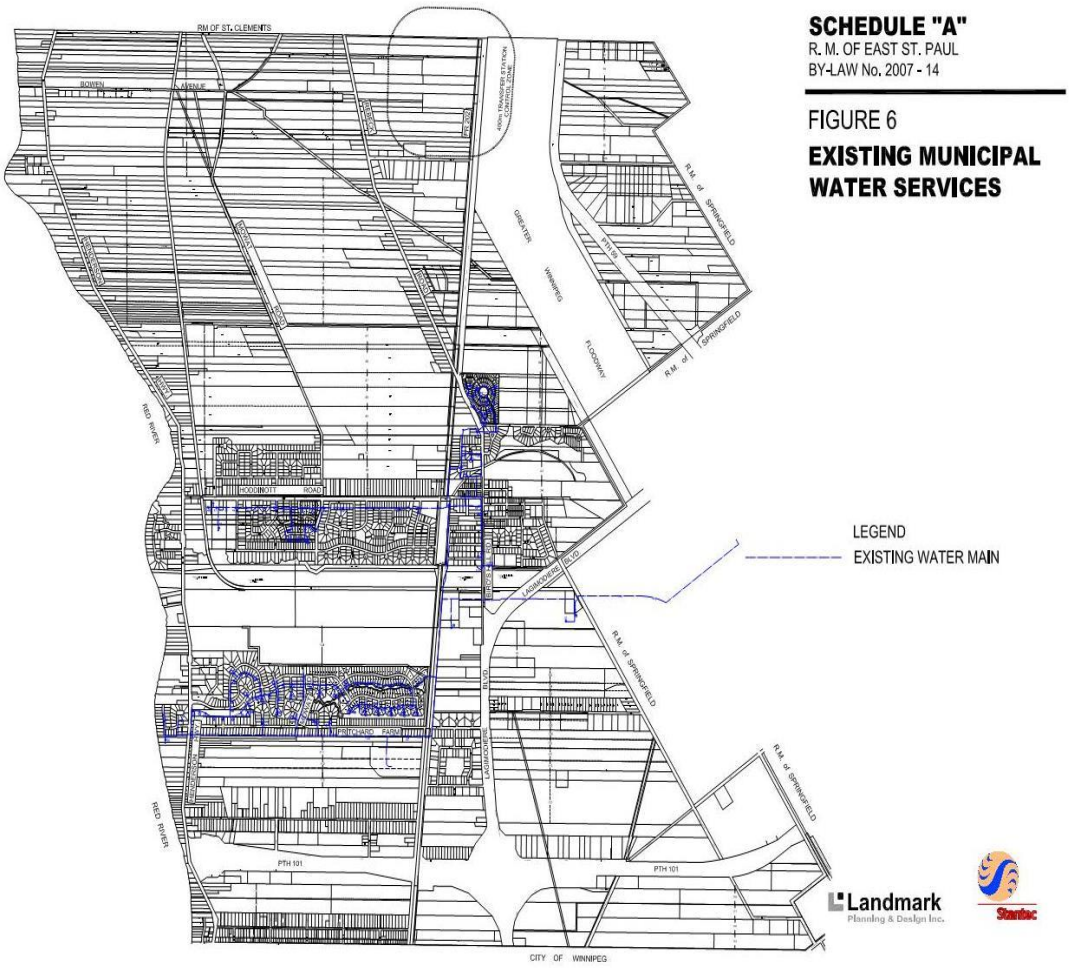


Figure 5: East St. Paul Water Services

Source: East St. Paul Development Plan

The 6 production wells are located in three different aquifers:

- Four wells in a sand and gravel aquifer east of the Red River Floodway in the RM of Springfield.
- One well in a carbonate bedrock aquifer east of the floodway on the RM of Springfield.
- One well in a bedrock aquifer adjacent to Wenzel Street in the RM of East St. Paul.

These wells operate under Environment Act Licence No. 2876 and individual Water Rights Licences for each well. The total annual withdrawal volume of these wells is 1,312,000 m^3 as per the licences issued by Manitoba Conservation and Water Stewardship. Most of the connections to the municipal system are in the southern more densely populated area of the municipality.

There is one semi-public system as shown in Table 6.1. which provided service to properties and developments with up to 15 service connections. This has been connected to East St. Paul and is now closed.

Table 6.1 Semi-Public Water Systems in East St. Paul

System Location	Municipality	Type	Operation
HYLAND PARK - SPWS	East St. Paul	Recreational Camp	Now closed.Connected to East St. Paul.

Source: Manitoba Conservation and Water Stewardship

The municipality conducted an assessment of its drinking water supply system in 2013. It was determined that the water quality meets the requirements of the provincial Drinking Water Safety Act (DWSA) and the Guidelines for Canadian Drinking Water Quality. The municipality is currently assessing a new raw water source to supply water for future growth and development. Included in this assessment are options on how to integrate this new water supply into the existing system.

The municipality has a 2013 operating budget for the water system of $495,000 and a capital budget of $1,088,000. Approximately 90% of the water system operating costs are recovered through service charges to users. Meter sales and hydrant rentals contribute additional revenue to the operating budget. Capital expenses are funded from municipal reserves as determined through the Council's annual budgeting process.

6.2 Water Demand and Use

The municipality services the more densely populated residential areas with drinking water through the piped municipal system. Meters record water usage for all connections on the municipal system including residential consumers in addition to commercial, industrial and institutional use that is converted to an equivalent residential unit (ERU). Average daily consumption as of 2012 was 838 m^3 or 0.28 m^3 / person which is higher than the RM's 10-year daily average of 0.26 m^3/person.

This report uses an average daily consumption of 300 L per person for planning purposes. It is anticipated that increased residential density into smaller lots and multi-family dwellings will reduce the daily average water consumption in the future.

Current total water demand is from existing residential, commercial and institutional users within the municipality. Annual domestic residential water demand is estimated at 990,537 m^3 based on the following data in Table 6.2.

Table 6.2: Current Estimated Annual Domestic Water Demand

Year	Population	Average Daily Volume/Person (m3)	Estimated Annual Domestic Water Demand (m3)
2011	9,046	0.30	990,537

6.3 Projected Growth Rates and Development Pattern

The municipality is planning for expansion of its existing municipal water supply system to accommodate future population growth. A recent study commissioned by the R.M. identified five residential developments totaling 556 water service connections to be completed by 2018. Future growth beyond 2018 equates to 64 water supply connections per year for water supply planning. The general growth pattern is a south to north direction beginning with infill developments in the more densely populated southern. Expansion northward is possible into a larger portion of undeveloped land between the Red River Floodway and Henderson Highway as shown on Map 4.

There is interest in completing a Secondary Plan to guide future development in the area east of PTH 59. This process is being identified by the municipality as part of potential commercial development of lands owned by Brokenhead Ojibway Nation. A key component of the Secondary Plan would involve a servicing plan to allow for phased development that is consistent with the Development Plan.

6.4 Future Water Supply and Demand

Groundwater from the carbonate aquifer and surface water from the Red River are available drinking water supply sources for the municipality. Access to groundwater for private individual wells does not require licensing through Manitoba Conservation and Water Stewardship therefore there is no way to monitor the cumulative impact that growth has on the water supply. Future domestic water demand is estimated to increase by 24.5% using population figures shown in Table 6.3.

Table 6.3 Future Population and Annual Water Demand in East St. Paul

Municipality	Population in 2011	Total Annual Groundwater Demand (m3) in 2011	Projected Population in 2033	Projected Total Annual Groundwater Demand (m3) in 2033
East St. Paul	9,046	990,537	11,260	1,232,970

The future water demand of 1,232,970 m^3 is less than the current licensed withdrawal volume of 1,312,000 m3. The municipality has access to an adequate licensed groundwater supply to meet its future demand.

6.5 Regional Growth and Planning Considerations

The RM of East St. Paul's municipal water supply and distribution system is meeting current demand and is being assessed for expansion to accommodate future growth. It is anticipated that the municipality will continue to develop piped water systems based upon the licensed volumes associated with their municipal wells.

The municipality may be in a position to supply water service beyond its boundary depending on future water allocation and license volumes. The north area adjacent to the south boundary of the RM of St. Clements could be a shared service area if there is future demand associated with piped wastewater service. Joint development of water and wastewater systems should be encouraged and be designed for phased extensions to accommodate future growth as communities build-out and/or intensify through infill development.

Capital funding for development of an inter-municipal system may be provided through a combination of municipal contribution, developer contribution, Provincial or Federal government grants.

7.0 RM OF WEST ST. PAUL

7.1 Current Water Supply, Infrastructure and Cost

There is one municipal water system with 65 service connections serving approximately 200 people at Rivercrest subdivision. The system includes a well, treatment plant and distribution piping. There are six semi-public systems as shown in Table 7.1. All other systems in the municipality are individual private systems.

A review of available water quality information for West St. Paul indicates that groundwater near the Red River is highly mineralized and exceeds the Canadian Drinking Water Guideline for chloride and sodium. However, water quality improves near the western boundary as it is less mineralized, meeting Canadian Drinking Water Guidelines.

The annual operating budget for the Rivercrest system is $30,760 for 2013 and $41,800 for 2014. The system is part of a Local Improvement District and 100% of the revenue is from service fees paid by users. Financing of private and semi-public systems is the sole responsibility of individual property owners.

Table 7.1 Semi-Public Water Systems in West St. Paul

System Location	Municipality	Type	Operation
Middlechurch Home of Winnipeg	West St. Paul	Personal Care Home	Year-Round
Rivercrest Early Learning and Child Care	West St. Paul	Child Care Facility	

Rivercrest Motor Hotel	West St. Paul	Food Handling Establishment	Year-Round
Royal Manitoba Yacht Club	West St. Paul	Food Handling Establishment	Seasonal
Sunova Centre	West St. Paul	Day Care	Year-Round
West St. Paul School	West St. Paul	School	Year-Round

Source: Manitoba Conservation and Water Stewardship

7.2 Water Demand and Use

Current water demand is from existing residential, commercial and institutional users. Annual domestic residential water demand is estimated at 540,054 m^3 based on the following figures in Table 7.2:

Table 7.2: Current Estimated Annual Domestic Water Demand

Year	Population	Average Daily Volume/Person (m^3)	Estimated Annual Domestic Water Demand (m3)
2011	4,932	0.30	540,054

7.3 Projected Growth Rates and Development Pattern

Middlechurch Settlement Centre is the primary growth area in the municipality. The Middlechurch Secondary Plan (adopted 2010) guides infill development and provides strategies and planning guidelines for land use, transportation and municipal servicing for the community of Middlechurch and surrounding areas. According to the secondary plan, the policy directions for the area are designed to create a more sustainable settlement pattern by replacing private service systems and independent waste water treatment plants with a comprehensive municipal service system.

The plan includes objectives and policies to help guide sustainable and cost-effective development in conjunction with municipal servicing. The key objective links new subdivision and infill development with the phased implementation of piped wastewater service.

The recently adopted West St. Paul North Secondary Plan identifies a residential growth area between Main Street and the Red River in the northern portion of the municipality. A key part of the plan is the future provision of piped wastewater service that will enhance development opportunities and necessitate a sustainable drinking water supply.

7.4 Future Water Supply and Demand

Groundwater from the carbonate aquifer and surface water from the Red River are available drinking water supply sources for the municipality. Access to groundwater for private individual wells does not require licensing through Manitoba Conservation and Water Stewardship

therefore there is no way to monitor the cumulative impact that growth has on the water supply. Future domestic water demand is estimated to increase by 56.7% using population figures shown in Table 7.3.

Table 7.3 Future Population and Annual Water Demand in West St. Paul

Municipality	Population in 2011	Total Annual Groundwater Demand (m3) in 2011	Projected Population in 2033	Projected Total Annual Groundwater Demand (m3) in 2033
West St. Paul	4,932	540,054	7,730	846,435

The municipality is currently assessing potential locations for groundwater wells to supply a public water system in the future. The cost of such a system cannot be determined until a schematic plan is in place. The system would meet the future increase in residential development associated with the trunk sewer project. The current water licensed volume for West St. Paul is 25,000 m^3. A licensed volume of at least 821,435 m^3 would be required to meet demand according to the population projections.

7.5 Regional Growth and Planning Considerations

Subdivision development projects should be required to establish or connect to a public water system in the growth areas with increased residential densities. The system would service a dedicated number of properties within the development and the developer would be responsible for the capital costs of connection. Ongoing operating costs would be funded by users on the system and administered by the municipality.

The most common funding formula for municipal water systems is a combination of developer contributions, Local Improvement District (LID), grant funding through Provincial and/or Federal government and user fees at each service connection. System components may include groundwater wells, surface water intake, reservoir, pumps, treatment plant and distribution piping. Water volume is typically metered at the receiving connection and reported back to the municipality for billing purposes.

There is potential opportunity for the municipality to partner with neighboring municipalities in a regional water system north of the City of Winnipeg. Factors for regional coordination among the municipalities include future water demand, infrastructure funding and cost-sharing opportunities. There may be opportunity for the RM of West St. Paul to coordinate a water system in the northern portion in conjunction with the RM of St. Andrews and the Lockport Settlement Centre as the trunk sewer is extended. Establishment of piped water systems should occur in conjunction with piped wastewater service in the planning district. Systems should be designed for phased extensions to accommodate future growth as communities build-out and/or intensify through infill development. Capital funding may be provided through a

combination of developer contribution, user connection fees and Provincial or Federal government grants.

8.0 VILLAGE OF DUNNOTTAR

8.1 Current Water Supply and Infrastructure

There are no public water systems in the village area. Water is supplied by private domestic wells, seasonal surface water sources and one semi-public system as shown in Table 8.1.

Table 8.1 Semi-Public Water Systems in Dunnottar

System Location	Municipality	Type	Operation
DUNNOTTAR ARTESIAN WELLS - SPWS	Dunnottar	Other	Year-Round

Source: Manitoba Conservation and Water Stewardship

Individual property owners are responsible for all costs associated with their domestic water supply systems. The municipality currently has no financial involvement in providing drinking water to individual properties.

8.2 Water Demand and Use

Current water demand is from existing residential and commercial users. Annual domestic residential water demand is estimated at 76,212 m^3 based on the figures in Table 8.2:

Table 8.2: Current Estimated Annual Water Demand

Year	Population	Average Daily Volume/Person (m^3)	Projected Annual Water Supply Volume (m3)
2013	696	0.30	76,212

8.3 Projected Growth Rates and Development Pattern

The community is fully built-out within its municipal boundary and future growth is limited to isolated infill or re-development projects within the village area. There was an attempt in 2013 by the village to annex lands in the RM of St. Andrews to expand its land base, increase development potential and meet the new population requirements in order to maintain municipal status. The annexation proposal was not successful and the Province continues to recognize the village's municipal status.

The permanent resident population is projected to remain unchanged in the future. Growth opportunities and population increase will only be possible if Dunnottar increases its municipal land base to provide for more development in the future.

8.4 Future Water Supply and Demand

Groundwater from the carbonate aquifer and surface water from the Red River are available drinking water supply sources for the municipality. Access to groundwater for private individual wells does not require licensing through Manitoba Conservation and Water Stewardship therefore there is no way to monitor the cumulative impact that growth has on the water supply. Future domestic water demand is estimated to remain constant with current demand using population figures shown in Table 8.3.

Table 8.3 Future Population and Annual Water Demand in Dunnottar

Municipality	Population in 2011	Total Annual Groundwater Demand (m^3) in 2011	Projected Population in 2033	Projected Total Annual Groundwater Demand (m3) in 2033
Dunnottar	696	76,212	696	76,212

8.5 Regional Growth and Planning Considerations

The most common funding formula for municipal water systems is a combination of a Local Improvement District (LID), grant funding through Provincial and/or Federal government and user fees hat each service connection. System components may include groundwater wells, surface water intake, reservoir, pumps, treatment plant and distribution piping. Water volume is typically metered at the receiving connection and reported back to the municipality for billing purposes.

A future regional public water system could potentially service the resort communities of Dunnottar and Winnipeg Beach based upon the seasonal increase in population. This would require interest from each municipal government to conduct a feasibility assessment to determine the water demand, water supply, service options and funding mechanism.

Establishment of piped water systems should occur in conjunction with piped wastewater service to create efficiencies in financing and system administration. Systems should be designed for phased extensions to accommodate future growth as communities build-out and/or intensify through infill development. Build-out beyond the current boundary of Dunnottar may be possible if land annexation or municipal amalgamation occurs in the future.

9.0 Summary of RRPD Drinking Water Planning Considerations

The projected population increase and related demand on the aquifer is the primary planning consideration for the RRPD. Water demand in the settlement centres in West St. Paul, St. Andrews and St. Clements will be intensified as infill projects and residential subdivisions are developed particularly along the Red River Corridor where piped wastewater service is established. Municipalities must demonstrate the capacity of the aquifer as a sustainable water source prior to approving development. This will require that municipalities and developers work with Manitoba Conservation and Water Stewardship to ensure groundwater supply is studied, licensed and monitored.

The following tables summarize the issues and planning considerations within the Planning District.

Table 9.1 Summary of Planning Considerations: Groundwater Licensing and Demand

Issue	Current Situation	Future Projections and Opportunity	Recommendations
Groundwater Licensing & Demand	Total licensed municipal annual volume under Water Rights License in RRPD is 3.7 million m^3 Total estimated annual domestic demand from RRPD population of 46,888 is 5.1 million m^3	RRPD population is projected to be 59,726 in 2033. Domestic water demand is projected to be 6.5 million m^3 in 2033 Growth areas are South St. Andrews, Lockport, Middlechurch and West St. Paul north adjacent to Main Street, East St. Paul north of Hoddinott Road, East Selkirk north and Grand Marais Total Water Rights License annual (municipal) volume in RRPD needs to increase by 3.4 million m^3 by 2033 to accommodate growth	Municipalities should engage MB Conservation & Water Stewardship in the Water Rights Licensing process to ensure an adequate supply of groundwater is available prior to approving developments Municipalities should require a groundwater study be completed prior to development in areas where groundwater information is not known Municipalities should work with Manitoba Conservation and Water Stewardship to develop an annual Water Budget that will track groundwater usage and availability

Table 9.2 Summary of Planning Considerations: Public Systems

Issue	Current Situation	Future Projections and Opportunity	Recommendations
Public Systems	In use or being constructed in Selkirk, East Selkirk, East St. Paul and Rivercrest. Total RRPD population	West St. Paul is assessing groundwater supply for a public system. Selkirk's system will	Based on this report, all municipalities need to determine their preferred go-forward strategy for

Issue	Current Situation	Future Projections and Opportunity	Recommendations
	connected to the systems is 12,603. Systems have Water Rights License annual volumes and certified operators.	accommodate projected growth to 2033. East St. Paul's system will accommodate projected growth to 2033. East Selkirk's system will accommodate projected growth to 2033. No plans for public system in Grand Marais. No plans for public system in Dunnottar. St. Andrews requires licensed groundwater allocations and public system(s) to meet demand from increased residential densities in South St. Andrews.	drinking water (private, semi-public or public) and initiate preliminary plans to determine the scope of the project and costs that will be incurred.

Table 9.3 Summary of Planning Considerations: Semi-Public Systems

Issue	Current Situation	Future Projections and Opportunity	Recommendations
Semi-Public Systems	36 systems in use in RRPD. MB Conservation monitors/inspects the systems using a risk-based approach. One system has Water Rights License volume of 25,000 m^3.	MB Conservation continues to expand the monitoring and inspection process.	Municipalities should request and receive a regularly updated list of systems from MB Conservation to include in a water budget.

Table 9.4 Summary of Planning Considerations: Private Systems

Issue	Current Situation	Future Projections and Opportunity	Recommendations
Private Systems	Estimated RRPD population using private systems is 34,285. MB Conservation does not monitor or license private systems.	If future development uses un-licensed private wells, groundwater withdrawals and supply from the aquifer will remain unknown. If non-metered private wells are used in conjunction with piped wastewater in future development, there may be increased volumes discharged into the municipal sewer.	Private wells should be inventoried and linked to population to monitor annual withdrawal volumes and be included in an annual water budget for each municipality. Once a public water system is connected, MB Conservation should assess private wells to determine if the location is a potential source for surface contamination to enter the groundwater.

Table 9.5 Summary of Planning Considerations: Regional Infrastructure Sharing

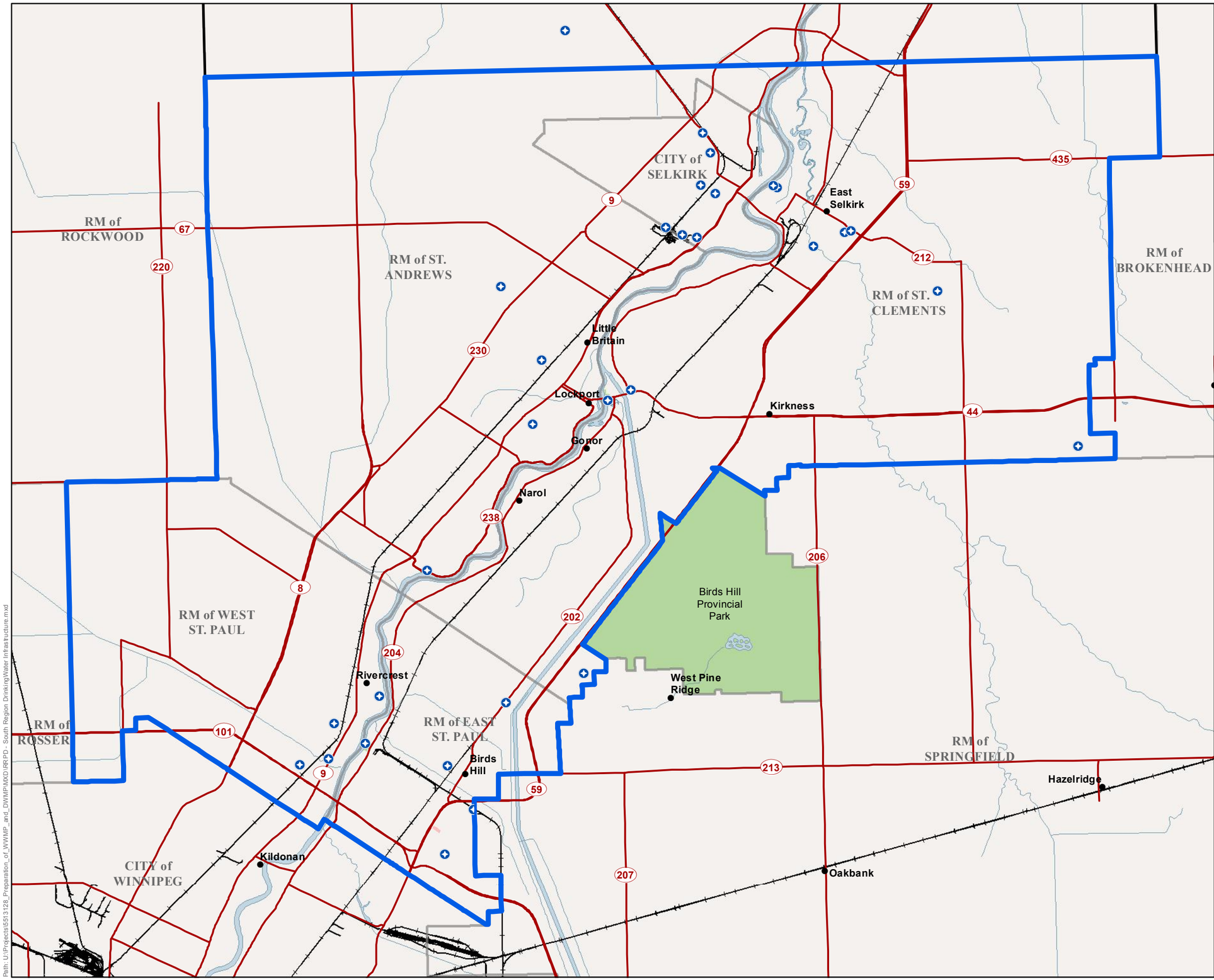
Issue	Current Situation	Future Projections and Opportunity	Recommendations
Regional Infrastructure Sharing	Currently one infrastructure sharing agreement in RRPD between Selkirk and RM of St. Andrews for the Mapleton Lane Condominium.	Future development to meet residential demand will be directed toward Settlement Centers in the RRPD municipalities. Inter-municipal drinking water sharing could be implemented between settlement centers in conjunction with piped wastewater service.	Infrastructure sharing should be explored between municipalities in the following locations: City of Selkirk and the portion of the RM of St. Andrews between Selkirk and PTH 44. RM of West St. Paul and capital region municipalities to the west. RM of West St Paul and the South St. Andrews Secondary Plan area. RM of St. Clements and Grand Beach Provincial Park. Southern portion of the RM of St. Clements and the northern portion of the RM of East St. Paul.

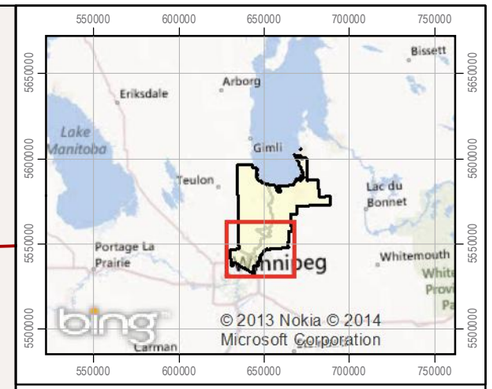
9.0 References

Betcher, R.N., (1997). *Rural groundwater quality surveys: southern and central Manitoba.* Proceedings of Rural Water Quality Symposium. March 25- 26, 1997 Canadian Water Resources Association.

Environment Canada, (1995). *Groundwater in Manitoba: Hydrogeology, Quality Concerns, Management*. National Hydrology Research Institute: Saskatoon, Saskatchewan.

APPENDIX A – Maps





Drinking Water Management Plan for The Red River Planning District

Drinking Water Licences

- Water Rights Licences

Land Base

- Community
- Road
- Rail Line
- Watercourse
- Lake
- Aboriginal Lands
- Provincial Park
- Rural Municipality
- South Region

Coordinate System: NAD 83, UTM Zone 14 N
Data Source: CanVec, ESRI, Prov MB, NRCan, MMM Group
Date Created: January 20, 2014
Revision Date: February 26, 2014

0 1 2 4 Kilometres
0 1 2 4 Miles

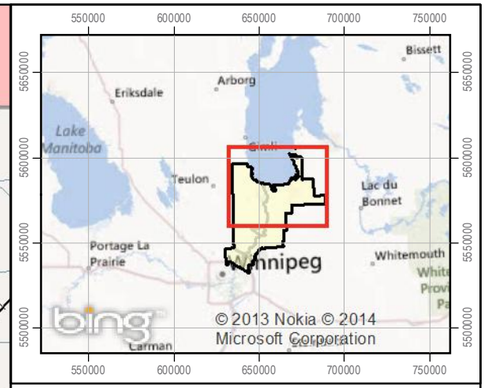
N

Map 1
Water Rights Licences in the South Region

MMM GROUP

Path: U:\Projects\5513128_Preparation_of_WWMP_and_DWMP\MXD\RRPD - South Region DrinkingWater Infrastructure.mxd

Siglavik
RM of GIMLI
8
Sandy Hook
Sandy Hook Golf Course
Winnipeg Beach
VILLAGE of DUNNOTTAR
232
RM of ST. ANDREWS
Netley
9
8
Petersfield
Clandeboye
320
Grand Beach Provincial Park
Grand Beach
Grand Marais
500
RM of ALEXANDER
304
Stead
Brokenhead Reserve (Scanterbury P.O.)
BROKENHEAD 4
RM of ST. CLEMENTS
Thalberg
12
Libau
59
317
RM of BROKENHEAD
Ladywood



Drinking Water Management Plan for The Red River Planning District

Drinking Water Licences

- Water Rights Licences

Land Base

- Community
- Road
- Rail Line
- Watercourse
- Lake
- Aboriginal Lands
- Provincial Park
- Rural Municipality
- North Region

Coordinate System: NAD 83, UTM Zone 14 N
Data Source: CanVec, ESRI, Prov MB, NRCan, MMM Group
Date Created: January 20, 2014
Revision Date: Feruary26, 2014

0 1.5 3 6 Kilometres
0 1 2 4 Miles

N

Map 2
Water Rights Licences in the North Region

MMM GROUP

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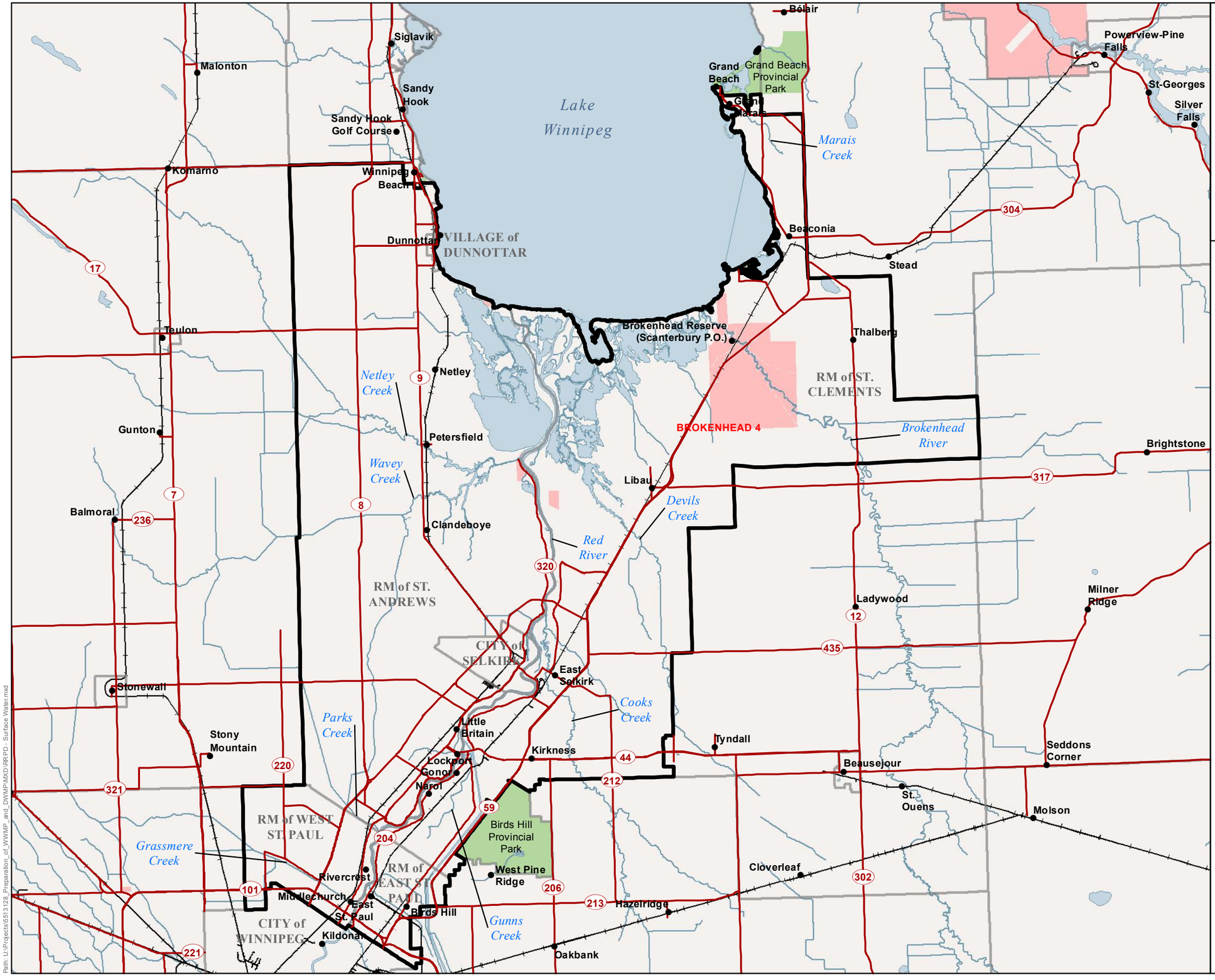
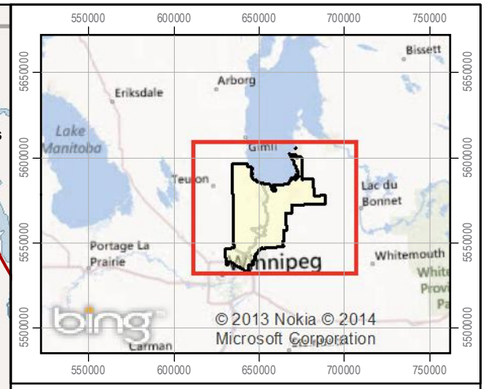




Drinking Water Management Plan for The Red River Planning District

Surface Water

- Watercourse
- Lake

Land Base

- Community
- Road
- Rail Line
- Aboriginal Lands
- Provincial Park
- Rural Municipality
- Red River Planning District

Coordinate System: NAD 83, UTM Zone 14 N
Data Source: CanVec, ESRI, Prov MB, NRCan, MMM Group
Date Created: January 20, 2014
Revision Date: Feruary26, 2014

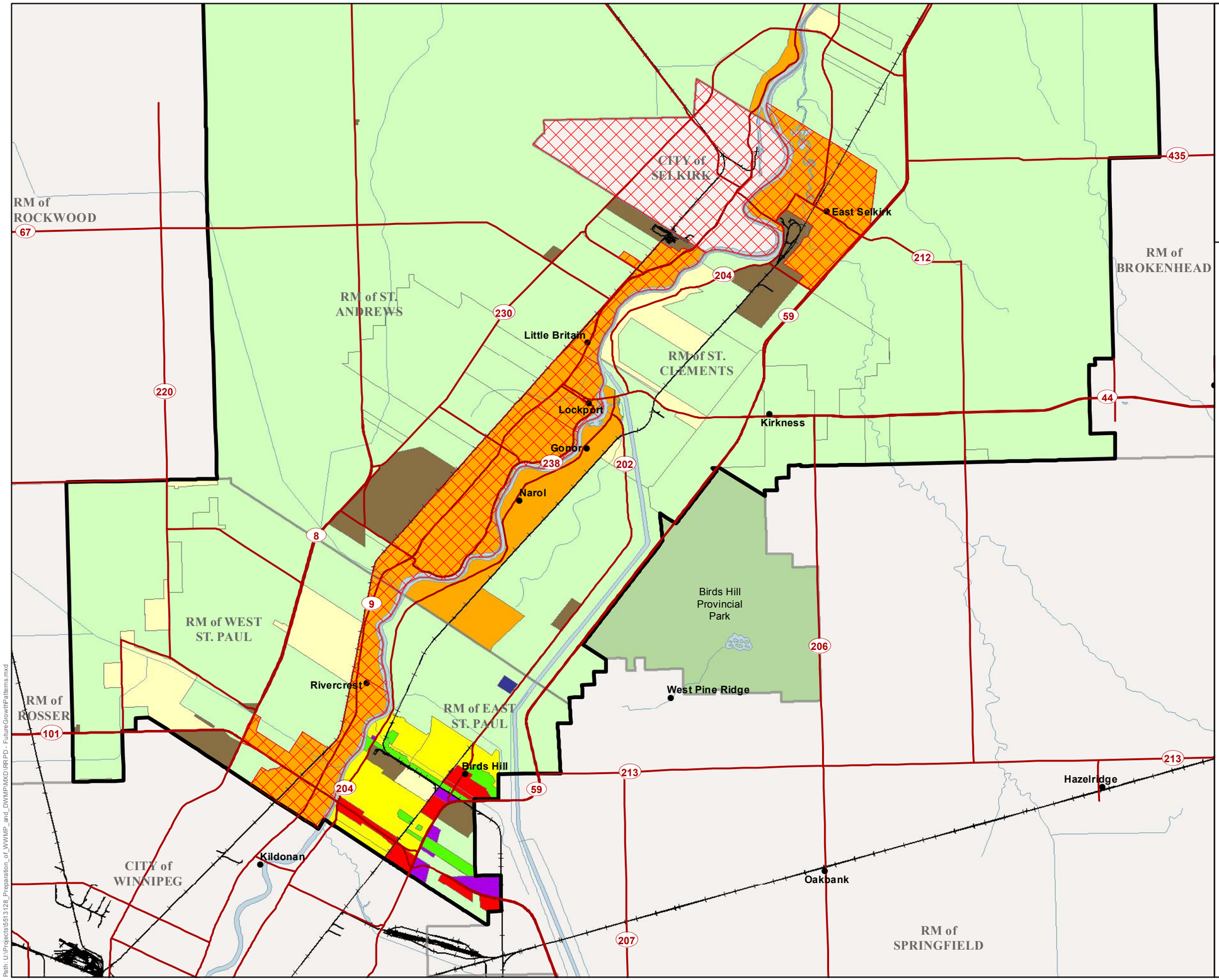
0 2.75 5.5 11 Kilometres
0 1 2 4 Miles

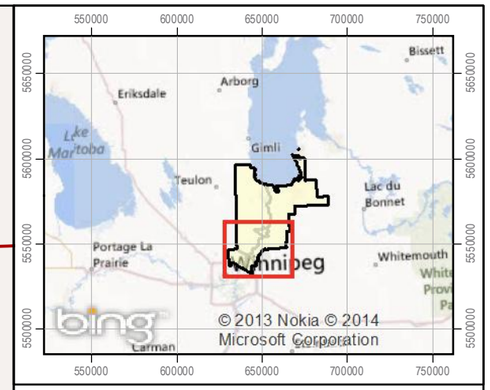
N

Map 3
Surface Water

MMM GROUP

Path: U:\Projects\5513\29_Preparation_of_WWMP_and_DWMP\MXD\RRPD - Surface Water.mxd





Drinking Water Management Plan for The Red River Planning District

Legend

Future Growth Area

Land Use Designation

- Commercial
- Industrial
- Institutional
- Mixed Use
- Open Space
- Park
- Parks and Recreation
- Residential
- Rural Residential
- Rural/Agricultural
- Settlement Centre
- Transfer Station

Land Base

- Community
- Road
- Rail Line
- Watercourse
- Lake
- Provincial Park
- Rural Municipality
- Red River Planning District

Coordinate System: NAD 83, UTM Zone 14 N
Data Source: CanVec, ESRI, Prov MB, NRCan, MMM Group
Date Created: January 20, 2014
Revision Date: May 26, 2014

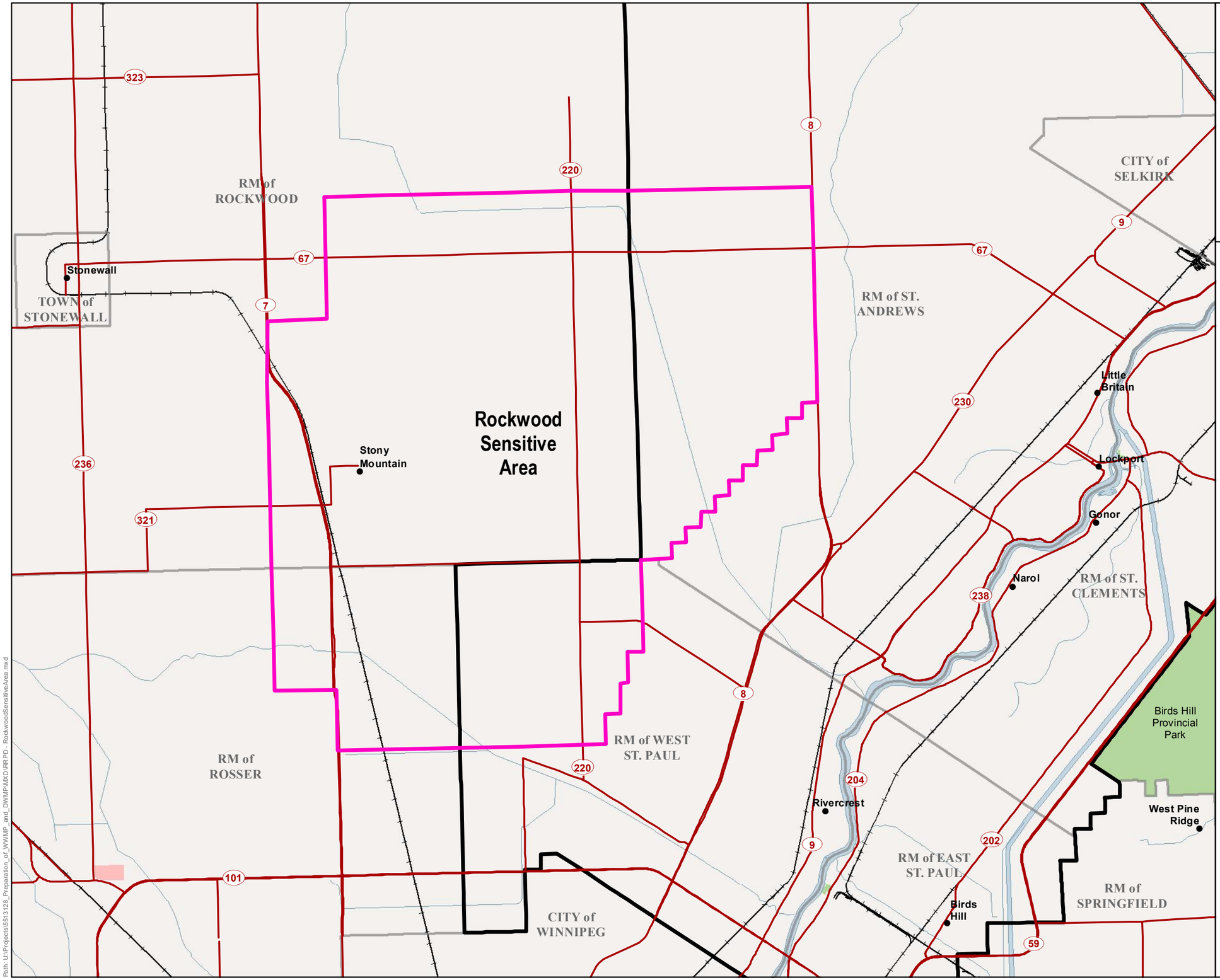
0 1 2 4 Kilometres
0 1 2 4 Miles

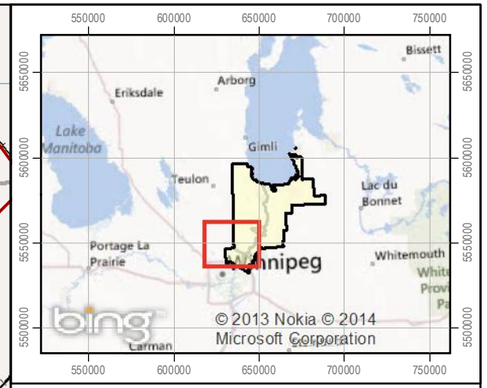
N

Map 4
Future Growth Patterns

MMM GROUP

Path: U:\Projects\5513728_Preparation_of_WWMP_and_DWMP\MXD\RRPD - FutureGrowthPatterns.mxd





Drinking Water Management Plan for The Red River Planning District

Land Base

- Rockwood Sensitive Area
- Community
- Road
- Rail Line
- Watercourse
- Lake
- Aboriginal Lands
- Provincial Park
- Rural Municipality
- Selkirk and District Planning Area

Coordinate System: NAD 83, UTM Zone 14 N
Data Source: CanVec, ESRI, Prov MB, NRCan, MMM Group
Date Created: January 20, 2014
Revision Date: February 26, 2014

0 1 2 4 Kilometres
0 0.5 1 2 Miles

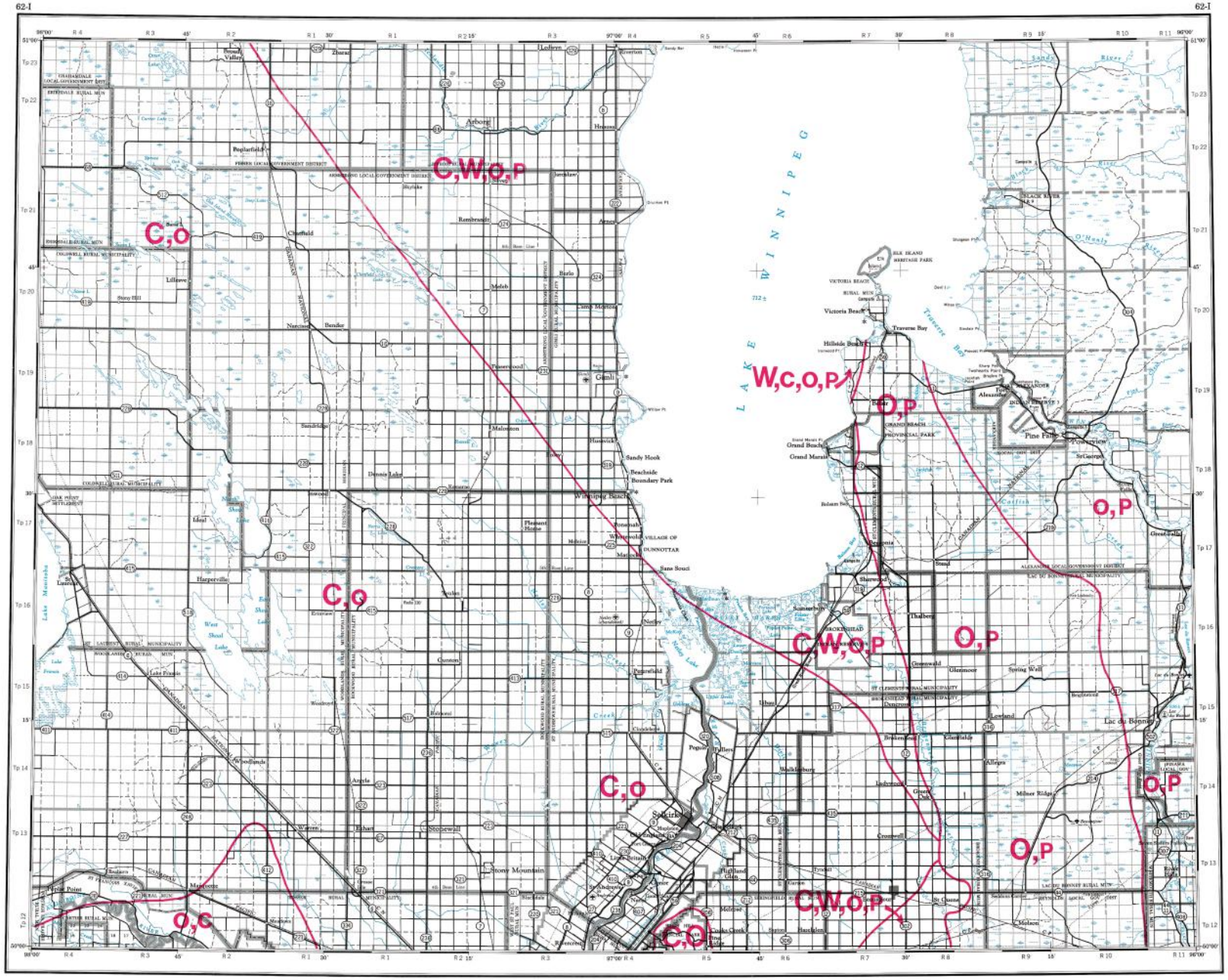
N

Map 5
Rockwood Sensitive Area

MMM GROUP

Path: U:\Projects\5513126_Preparation_of_WWMP_and_DWMP\MXD\RRPD - RockwoodSensitiveArea.mxd

62-I



LEGEND

OVERBURDEN AQUIFER PRESENT (major*, minor+) ..... O,o

CARBONATE ROCK AQUIFER PRESENT (major, minor) ..... C,c

WINNIPEG FORMATION AQUIFER PRESENT (major, minor) ..... W,w

PRECAMBRIAN ROCK AQUIFER PRESENT (major minor) ..... P,p

* A major aquifer, as defined for the purposes of this map, is an aquifer which has widespread areal distribution, occurs within 180 m of the ground surface and is capable of supplying sufficient quantity and quality of groundwater to satisfy domestic needs (0.3+ L/s with total dissolved solids less than 2000 mg/L).

\+ A minor aquifer, as defined for the purposes of this map, is a aquifer occuring within 180 m of the ground surface in which groundwater quality is acceptable (less than 2000 mg/L total dissolved solids) but the aquifer is not present throughout the area or the ability of the aquifer to supply sufficient volumes of water for domestic needs (0.3+ L/s) is not always present.

DISCUSSION

Aquifers present in the study area include 1) overburden aquifers which are generally sands and gravels 2) the carbonate rock aquifer which is a general term for all bedrock aquifers from the Ordovician Red River Formation through the Silurian Interlake Group 3) the Winnipeg Formation aquifer and 4) the Precambrian rock aquifer.

Overburden aquifers of sand and gravel occur extensively in glacial moraines and other glacial deposits throughout much of the area between the Brokenhead and Winnipeg Rivers and in the Birds hill area (Tp. 12, R.4 & 5E). Properly constructed and developed wells completed in these materials may yield from 1 to 40 L/s (Rutulis, 1979). Elsewhere sand and gravel aquifers occur locally within till deposits and, more commonly, at the till-bedrock contact. Where carbonate rock is present these sand and gravel aquifers are rarely utilized although in places they may be capable of fairly high yields. East of the Winnipeg River widely scattered sand and gravel deposits form generally low yield aquifers which, however, are utilized where found due to the uncertainty and expense of developing groundwater supplies from the underlying Precambrian bedrock.

The carbonate rock aquifer occurs throughout the western and central part of the map sheet. Wells drilled into this aquifer will almost invariably obtain sufficient yield for household use and yields in excess of 50 L/s can be developed in many areas. Well yield does vary widely from place to place due to variations in fracture frequency, aperture, interconnection and infilling with fine-grained sediments. Water quality is generally good although hard. Saline groundwater is found throughout the full thickness of this aquifer in the extreme southwestern corner of the map sheet and in the lower sections of the aquifer in the southern third of the map sheet west of the Red River.

The Winnipeg Formation aquifer underlies the carbonate rock aquifer throughout the map sheet. Wells completed into this aquifer will generally yield 1—5 L/s with yield up to 10 L/s possible in some areas. Within the map sheet much of this aquifer contains saline groundwater which is unusable for most purposes.

The Precambrian rock aquifer is used as a source of groundwater supply only in the extreme eastern part of the map sheet where alternate sources of groundwater are not available. Well yields in this aquifer are highly variable, ranging from "dry holes" to isolated wells that yield 10 L/s or more. Methods for predicting the locations where moderate yields can be obtained from this aquifer remain essentially undeveloped. Water quality from the aquifer ranges from excellent to poor. Groundwaters in the Precambrian rock are assumed to be saline in those areas in which the groundwaters in the overlying Winnipeg Formation aquifer are saline.

Use of Map

The map sheet has been divided into a number of sub-regions based on the presence of major or minor aquifers. Each sub-region has been identified by a series of letters indicating the aquifers present and whether those aquifers are considered major or minor aquifers within the sub-region. These aquifer symbols have been arranged by ease of aquifer development; the cheapest aquifer to develop is placed first followed by succedingly more expensive or less likely aquifers.

For example, the symbols C, W, o, p, indicate that both the carbonate and Winnipeg Formation aquifers occur extensively and both aquifers will produce good quality groundwater in sufficient quantities for domestic use throughout the sub-region. The carbonate aquifer symbol is placed first since it overlies the Winnipeg Formation aquifer and wells are generally less expensive to complete in the carbonate rock than in the Winnipeg Formation. The symbols also indicate that overburden or Precambrian rock aquifers are present in some parts of the sub-region and will yield fresh groundwater where present.

Reference:

Rutulis, M., 1979, Groundwater Resources in the Brokenhead Planning District: Manitoba Water Resources Branch.

Prepared by: R.N. Betcher, 1985

Magnetic declination 1976 varies from 7°30' easterly at centre of west edge to 9°45' easterly at centre of east edge. Mean annual change decreasing 4.9'.

Base Map by: Surveys and Mapping Branch, Department of Energy, Mines and Resources, Ottawa.

PROVINCE OF MANITOBA

DEPARTMENT OF NATURAL RESOURCES

WATER RESOURCES BRANCH

GROUNDWATER AVAILABILITY STUDY

SELKIRK AREA

GENERALIZED AQUIFER MAP

MAP LEGEND

Road
Railway
Town
Village or Settlement
Intermittent Lake and Stream
Marsh or Swamp

Scale 1:250 000

Miles 5 0 5 10 Miles

Kilometres 5 0 5 10 15 Kilometres

Cartography by: Water Resources Branch, Manitoba, 1985/86

"A Canada-Manitoba Interim Subsidiary Agreement on Water Development for Regional Economic Expansion and Drought Proofing Project."

MAP 6