Report on Public Hearing

Pembina Valley Water Cooperative

Supplemental Groundwater Supply System

February 2007

Manitoba CLEAN·ENVIRONMENT COMMISSION

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January 31, 2007

Honorable Stan Struthers
Minister of Conservation
Room 330 Legislative Building
450 Broadway
Winnipeg, Manitoba

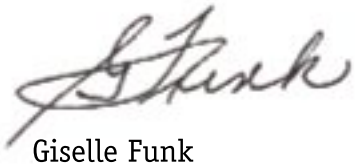
Re: Pembina Valley Water Cooperative Supplemental Groundwater Supply Proposal

Dear Minister Struthers,

The Panel is pleased to submit the Clean Environment Commission's report on the public hearing with respect to the Pembina Valley Water Cooperative Supplemental Groundwater Supply Proposal.

Sincerely,

Terry Sargeant, Chairperson



Giselle Funk

Ken Gibbons

Ian Halket

Manitoba

Table of Contents

Foreword

It has long been common knowledge that the area of southern Manitoba to the west of the Red River has a serious shortage of potable water. This shortage has affected the manner in which the region has grown and developed. The past couple of decades have seen significant economic and population growth, which, in turn, has put additional strains on the limited water supply.

In the early-90's, the local governments in the area came together to form the Pembina Valley Water Co-operative to address these water concerns. It has been very successful in carrying out this mandate.

The issue before the Clean Environment Commission—a proposal to develop an alternative source of drinking water—makes eminent sense when viewed in the context of the PVWC's mandate.

However, as will be set out in this report, the Panel concluded that there are significant concerns that must be addressed before this particular proposal is authorized to proceed. In the simplest terms, the Panel's concerns focus on the ongoing sustainability and availability of high quality drinking water in Manitoba.

In the global picture, Manitobans are in the enviable position of having one of the world's best supplies of fresh water. But, to some extent, we have come to take it for granted, without worrying about future users. Manitobans are high consumers of water, averaging more than 400 litres per day, twice the European average and ten times more than people in less-privileged parts of the world.

(We do note that water consumption in the PVWC service area is much lower than in most of the rest of the province, due in part to successful demand-side management initiatives, as well as the high cost of water.)

In recent years, there have been occasions in Canada, including a few in Manitoba, when the drinking water supply has been compromised, leading to "boil-water" or "do-not-drink" orders. The Panel found no evidence that such a threat is likely to occur in the water service provided by the PVWC.

Nor, did we find that—in its construction phase—the proposed water project posed any significant, immitigable environmental concerns. What we did find is that there is insufficient information available in respect of the sustainability of the water resources in the area. That lack of information made it impossible for us to determine whether the proposed project would be without long-term environmental concerns.

We concluded that, before individual groundwater projects are authorized, the larger planning initiatives envisioned by the government in recent legislation and policy, be completed.

On a matter not directly-related to the proposal before us, the Panel wishes to reiterate the calls made in our reports on

the Wuskwatim hydroelectric project and the Floodway expansion, wherein we called upon the Government of Manitoba to enhance the standards of performance in environmental assessment.

It is the Commission's view that environmental assessment is an ever-evolving art that must strive for constant improvement. To that end, we would repeat our recommendations from those earlier reports, as set out in our final recommendation in this report.

We believe that this would not only improve environmental assessment, but would also streamline the process. CEC reviews would proceed more quickly and, likely, at less expense.

The Panel acknowledges the contributions to our hearing process of all of the parties—the proponent, funded participants and presenters. All were positive and respectful in their participation.

The proponent—the Pembina Valley Water Co-operative—was particularly forthcoming in responding to requests for further information in respect of their proposal. Early in the process, this included a request from the Panel for a significant amount of clarification and additional information.

Finally, I would like to acknowledge the contribution of my co-panelists—Ken Gibbons and Ian Halket, of Winnipeg, and Gisele Funk, of Boggy Creek—as well as the support of Commission staff, Cathy Johnson and Joyce Mueller, and our report writer, Doug Smith.

Terry Sargeant, Chair

January 2007

Executive Summary

The Clean Environment Commission conducted a public hearing into the Pembina Valley Water Cooperative Supplemental Groundwater Supply Proposal from November 7 to November 9, 2006. The Commission's mandate was to consider the potential environmental effects of the Proposal and provide a recommendation on whether an Environment Act Licence should be issued for the Project. Should the Commission recommend the issuance of an Environment Act Licence, then appropriate recommendations should be provided respecting:

- the potential environmental effects of the proposed water withdrawals from the Agassiz Sandilands Upland area aquifer complex and its movement by pipeline to the proposed service area;
- measures proposed to mitigate any adverse environmental effects resulting from the project and where appropriate, to manage any residual adverse effects; and
- future monitoring and research that may be recommended in relation to the project.

The Commission's recommendations were to incorporate, consider and directly reflect, where appropriate, the Principles of Sustainable Development and Guidelines for Sustainable Development as contained in *The Sustainable Development Act*.

The Commission has assessed the evidence presented to it through the hearing process and in light of existing Government of Manitoba water-management policy. The Commission recognizes that Pembina Valley Water Cooperative has played and continues to play an important and positive role in developing and conserving water resources in Manitoba. However, the Commission has concluded that the Project cannot be appropriately assessed in the absence of an integrated watershed plan for the Manitoba portion of the Red River basin including associated aquifer plan(s) for the Sandilands aquifers. Therefore, it is recommending against granting an Environment Act license for the Project.

There is a need for the Manitoba government to fully implement its policies and regulations in relation to water management. This would include the development of a basin-wide water management plan for the Red River that integrates watershed and aquifer planning.

The provincial government has an important role to play in assisting the PVWC in developing supplemental and emergency water supplies. An important step in this process would be the negotiation of a guaranteed-flow agreement for the Red River. Finally, the Commission is continuing its

advocacy of higher standards of performance in environmental assessment.

1. Introduction

1.1 Manitoba Clean Environment Commission

The Clean Environment Commission (the Commission) is an arms-length provincial agency established under *The Environment Act* of Manitoba. The Commission encourages and facilitates public involvement in environmental matters and offers advice and recommendations to the Minister of Conservation with respect to environmental issues, project approvals, and environmental licenses.

Its mandate is exercised through public hearings, investigations, and mediation. The Commission consists of a full-time Chairperson and part-time Commissioners appointed by Order-in-Council.

1.2 Terms of Reference

On May 26, 2006, the Minister of Conservation issued terms of reference to the Commission to conduct a public hearing respecting the Pembina Valley Water Cooperative Supplemental Groundwater Supply Proposal (the Project). The Terms of Reference state that:

> For the potential environmental effects of the Proposal, the Commission shall consider the four reports associated with the Proposal, and public concerns, and provide a recommendation on whether an *Environment Act* Licence should be issued to the Pembina Valley Water Cooperative Inc. for the project. Should the Commission recommend the issuance of an *Environment Act* Licence for the Proposal, then appropriate recommendations should be provided respecting:
>
> - the potential environmental effects of the proposed water withdrawals from the Agassiz Sandilands Upland area aquifer complex and its movement by pipeline to the proposed service area;
> - measures proposed to mitigate any adverse environmental effects resulting from the project and where appropriate, to manage any residual adverse effects; and
> - future monitoring and research that may be recommended in relation to the project.
>
> The Commission is requested to make non-licensing recommendations on other matters as appropriate. In particular, recommendations on matters that are regulated by other Manitoba statutes should be addressed as non-licensing recommendations pursuant to the *Environment Act*.
>
> The Clean Environment Commission's recommendations shall incorporate, consider and directly reflect, where appropriate, the Principles of Sustainable Development and Guidelines for Sustainable Development as contained in the *Sustainable Development Act*.

1.3 The Panel

A four-person panel was formed for this hearing. Members included the Commission Chair, Terry Sargeant (who also served as chair of the Panel), Ian Halket, Kenneth Gibbons and Gisele Funk.

The Panel met in June 2006 to begin preparation for the hearing after reviewing the four documents and public comments provided, as described in the Terms of Reference. The Panel unanimously concluded that the material provided by the Proponent and forwarded by Manitoba Conservation was insufficient to proceed with a hearing, and insufficient upon which to base any recommendations to the Minister.

The Panel requested that Manitoba Conservation facilitate the provision of additional materials to assist in defining the project under review and its environmental effects. Once the materials were received the hearing process then progressed. The hearing commenced on November 7, 2006 and concluded on November 9, 2006, the Panel sat for 2 days in Friedensfeld. For a full list of presenters see Appendix A.

1.4 Additional Participants

As facilitated by the Participant Assistance Regulation under *The Environment Act,* funding was made available to groups and individuals to assist in their representation to the Panel. Only one group applied and received funding, the Manitoba Eco-Network, Water Caucus.

1.5 Regulatory Framework

As a water development and control project, the Project is defined a Class 2 development. The regulatory approvals needed are an *Environment Act* License under Manitoba's *The Environment Act* and a Water Rights License under Manitoba's *The Water Rights Act*. The Canadian Environmental Assessment Agency stated that approvals under the *Canadian Environment Assessment Act* are not required for this project. Approvals are also required from Manitoba Highways, the Manitoba Office of Drinking Water, the Canadian Pacific Railway, the Canadian National Railway, and the various utilities whose transmission lines the pipeline may come into proximity with.

While the Director of Environmental Assessment and Licensing can issue approvals under *The Environment Act* for such projects, where the Director receives objections and reasons for the objections with respect to a proposed development, the Director may recommend to the Minister responsible for *The Environment Act* that the Clean Environment Commission hold hearings into the proposal. The PVWC filed its license application in December 2005. Given that the application gave rise to a number of objections, the Director recommended that the Commission hold public hearings on the Project.

The Commission must provide the Minister with a report within 90 days of the close of the hearing. Upon receipt of this report, the Minister of Conservation must either adopt the Commission licensing recommendations or provide written reasons for rejecting them.

This report to the Minister of Conservation presents an overview of the Project, the regulatory context of the Project, a summary of the hearings, and provides comments and recommendations on environmental issues of concern as identified by the public and the Panel members.

2. The Proponent and the Project

2.1 The Proponent

The proponent is the Pembina Valley Water Cooperative (PVWC), which is owned by 18 member municipalities located in south-central Manitoba. They are:

The Town of Altona
The Town of Carman
The Rural Municipality of Dufferin
The Town of Emerson
The Rural Municipality of Franklin
The Town of Gretna
The Rural Municipality of Grey
The Rural Municipality of Montcalm
The Town of Morden
The Rural Municipality of Morris
The Town of Morris
The Town of Plum Coulee
The Rural Municipality of Rhineland
The Rural Municipality of Roland
The Village of St. Claude
The Rural Municipality of Stanley
The Rural Municipality of Thompson
The City of Winkler

Figure 2.1 provides an overview of the region served by the PVWC. Incorporated in 1991, the PVWC's mandate is to provide treated, potable water to its member municipalities on a user-pay basis through a pipeline system owned by the PVWC. The municipalities then deliver the water through their own distribution systems. The PVWC's population base is approximately 45,000. According to the PVWC, it supplies water for domestic and municipal use and none of its water is used for irrigation.

The PVWC's water sources are the Stephenfield Reservoir on the Boyne River and water treatment plants on the Red River at Morris and Letellier. The treatment plant at Morris can produce up to 35 litres per second and services both the Town and Rural Municipality (RM) of Morris, the RMs of Roland and Thompson and part of the City of Winkler and the RM of Stanley. The treatment plant at Letellier can produce 100 litres per second and services the Towns of Emerson, Altona, Gretna, Plum Coulee, and Morden, and the City of Winkler, and the RMs of Franklin, Montcalm, Rhineland, Stanley, and the Roseau River First Nation. The Stephenfield plant can produce 25 litres per second and supplies St. Claude, Carman, and Haywood, and the RMs of Dufferin, Grey, and Thompson.

The PVWC is not the only source of water in the region: for example, 90 per cent of Morden's water comes from Lake Minnewasta, 60 per cent of Winkler's water comes from the Winkler aquifer, and 75 per cent of Carman's water comes from the Boyne River.

The PVWC told the Commission that the population of the region that it services grew by 9.8 per cent from 1990 to 2000 and that it was expected that this growth rate would continue into the future. At the same time that population continues to grow, the PVWC

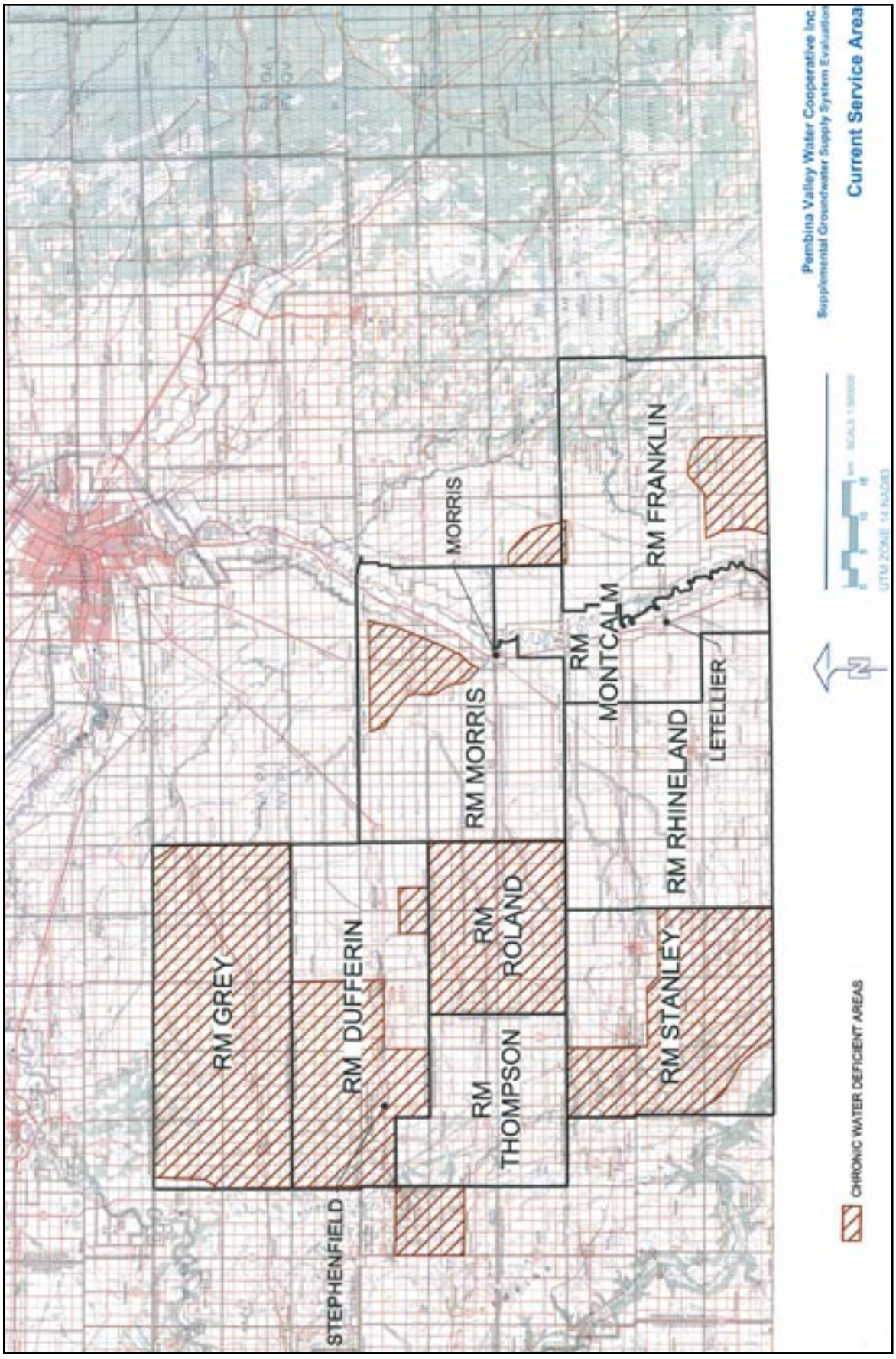


Figure 2.1 PVWC service area

stated that the water supply in the region faces a number of challenges. Key among these were:

- Concerns over the PVWC's dependence on the Red River. Along with the Red's susceptibility to drought, the PVWC pointed to the fact that there was no minimum-flow agreement with the United States regarding the Red River. As a result, the PVWC said, in a severe drought, it was possible that the United States government might divert the entire flow of the Red River to the United States.
- Red River water quality. The PVWC stated that it was concerned that the quality of water in the Red River was susceptible to upstream spills and contamination.
- The potential impact of drought on the PVWC water supply. The PVWC stated that currently when Red River water levels are low, the Morris and Letellier water treatment plants, which take their water from the Red River, are not able to operate at full capacity. The PVWC stated that all of its water sources were drought sensitive.
- Limitations of existing aquifers in the region. There are only two aquifers in the region that do not contain brackish or saline water: the Winkler aquifer and the Miami aquifer. The Winkler aquifer is being pumped at a rate that exceeds its sustainable yield. Furthermore, there are concerns that saline water from nearby bedrock aquifers would intrude into this aquifer. The smaller Miami aquifer has poor quality water and, according to the PVWC, is likely to have a lower yield than the Winkler aquifer. Due to the difficulty that the Town of Miami experienced in trying to treat the water from this aquifer, the Town discontinued use of the aquifer and draws it water from the PVWC.
- Limitations of local resources. There is no opportunity for increased supplies from the Boyne River, the Stephenfield Lake Reservoir or other local resources.

2.1.1 PVWC Consumption

The PVWC noted that while the regional population is growing, its per capita consumption is not growing. It also argued that its high price for water and lack of discounts and lack of a declining price scale (particularly for high-volume users) are in keeping with best practices for water conservation. The PVWC stated that "water consumption rate in litres per person per day (l/p/d) within the PVWC distribution area compares well with the rest of the province with some PVWC communities among the lowest." PVWC member municipalities sell water at prices that vary from $6.50 to $10 per 1,000 gallons. According to the PVWC, Winnipeg charges $4.46 (with volume discounts) while Portage la Prairie charges $3.80 (decreasing to $1.02 for usage over one-million gallons). In its presentation the PVWC provided, as examples, the consumption rates in two PVWC communities. The Winkler rate was 268 litres per person per day and the Altona rate was 373 litres per person per day (when the consumption of the Bunge Canola oil producing plant is excluded, the Altona rate falls to 240 litres per person per day). The rate for PVWC RMs ranges from 199 litres per person per day to 235 litres per person per day. For sake of comparison, the PVWC stated that the rates for Winnipeg and Portage la Prairie are 361 and 428 litres per person per day.

The PVWC water budget from October

2005-September 2006, during which time the total PVWC usage was 700,470,372 gallons, is shown in Table 2.1.

Table 2.1
PVWC Water Budget October 2005-September 2006.

User	Gallons	% of use
Used by industry	68,733,879	10
Agricultural industry	82,005,739	12
Municipalities	56,037,629	8
Domestic use	493,693,134	70

2.1.2 Alternatives

Concerns over the impact of drought and future demand have led the PVWC to examine a number of potential water sources. These include:

- A dam on the Red River. While the PVWC says that this is currently its only recourse in the event of a drought, it recognized that there are environmental and fisheries concerns related to such a development.
- The Assiniboine River. According to the PVWC there is no additional water to be allocated from this river.
- The Pembina River. The PVWC stated that an impoundment (a reservoir) on the Pembina would have environmental implications.
- A regional supply. A pipeline from a secure regional groundwater source that would be less susceptible to drought than the PVWC's current sources.

This last option is the basis for the Proposal under consideration.

2.1.3 Options in Eastern Manitoba

In outlining its decision to search for a groundwater source in Eastern Manitoba, the PVWC made the following key points:

- The aquifers in the PVWC region are either brackish or lack the storage capacity required to withstand a drought.
- There are no additional groundwater sources west of the Red River for the PVWC to develop.
- The annual precipitation in Manitoba increases from west to east.
- Southeastern Manitoba has significant water resources. The PVWC cited such swamps and bogs as the Rat River Swamp, the Caliento Bog, the Sundown Bog, the St. Labre Bog, and the Brokenhead Swamp. There are also five rivers in the area: the Roseau, the Rat, the Seine, the Brokenhead, and the Whitemouth.
- The quantity of water in groundwater sources is often relatively high even when surface water sources can be experiencing the effect of drought.
- Aquifers in Eastern Manitoba are essentially drought proof.

When examining areas in Eastern Manitoba for potential water sources, the PVWC established the following guidelines:

- The preferred groundwater exploration target would have a minimum potential to impact the environment.
- The preferred groundwater exploration target would have a minimum potential to affect existing groundwater users, and a minimum potential to limit the reasonably foreseeable future development of the area around the well.

- The capacity of the aquifer being utilized must be sustainable over the long term, both in terms of water quantity and quality.

On the basis of these criteria, the PVWC eliminated the following locations.

- The area north of Provincial Highway 205, since there is considerable development of the area's groundwater resources.
- The area west of the Rat River because of the water's brackish and saline quality.
- Shallow sand aquifers because they did not constitute a sustainable supply.
- The Winnipeg Formation bedrock aquifer. Tapping this aquifer could have the effect of moving the interface between saline and non-saline water further east.

This led it to select the Sandilands as its preferred source for water. The area has been subject to study by the federal and provincial government and academic researchers. These studies, according to the PVWC, showed there were "significant water resources, and that the regional setting was suitable for the development of these resources in an environmentally sustainable manner."

2.2 Aquifers

Before further describing the Project, it is necessary to make a number of points about aquifers. An aquifer is an underground layer of permeable rock or sand that serves to store water and can act as a water supply. There are two types of aquifers: confined and unconfined. An unconfined aquifer is one that is broadly open to downward percolation of water from the land surface above whereas a confined or semi-confined aquifer is one that lies beneath an aquitard, an impermeable layer of rock or sediment, that serves to isolate the aquifer from the waters above. However confined aquifers do have a recharge area within their headwater that is open to the surface which is the source of water for the aquifer.

The flow of water into an aquifer is known as recharge, the flow out of an aquifer is known as discharge. Recharge calculations start with total volume of annual precipitation over the recharge area of the aquifer, and then subtract amounts lost to evapotranspiration, surface runoff, and other losses along the downward flow pathway to the aquifer. This process, which depends to a great extent on the soil conditions encountered along the recharge pathway can take many years. In the order of 40 years for the aquifer under consideration in this study according to Cherry (2000). Water that infiltrates the ground will flow in either a local, intermediate, or regional scale flow system. A local flow system might be a drainage ditch: water flow through such a system is generally measured in days to months. Intermediate scale groundwater flow systems generally have pathways that extend for several miles that it might take water several years to traverse.

Manitoba has a wealth of confined and unconfined aquifers situated in surficial sediments and bedrock. Examples of two high yield aquifers, one an unconfined surficial aquifer and the other, a confined bedrock aquifer are the Assiniboine Delta Aquifer and the Carbonate Aquifer. The Assiniboine Delta Aquifer is a water-bearing sand deposit, which was formed when an ancestral Assiniboine River flowed into Lake Agassiz between Brandon and Portage la Prairie. The Carbonate Aquifer, which extends from The Pas to the Interlake and down along the east side of Lake Winnipeg into the United States, is the largest freshwater aquifer in Manitoba and serves as the prime groundwater source for south-

eastern Manitoba. Groundwater flows through this aquifer to topographic low points. In the southern part of the province, this means it generally flows towards the Red River. The Red River (along with the Rat River) also serves as a divide between those portions of the aquifer which have a high saline content (to the west of the Red) and those with a low saline content.

The Carbonate Aquifer is referred to as a bedrock aquifer because it is contained in the Winnipeg (largely made up of dolomites and limestone) and Stony Mountain (largely made up of dolostone) bedrock formations.[1] It has three sources of recharge: saline and brackish water from the Williston Basin, freshwater from the area between Lakes Winnipeg and Manitoba, and freshwater from the Sandilands Glaciofluvial Complex. In southeastern Manitoba, another bedrock aquifer is located in the sandstone and shale Winnipeg Formation, below the Carbonate Aquifer. Known as the Sandstone Aquifer, it is used primarily for rural domestic purposes.

2.3 The Project

The following description of the Project is based on the PVWC's various submissions and the evidence it presented at the Hearing. In Chapters Four and Five, the Commission will comment on of the Project in light of concerns regarding provincial water policy and aquifer sustainability.

The PVWC is proposing to construct a pumping well in the Sandilands Provincial Forest to pump water from a semi-confined aquifer 95.3 kilometres, through a gravity-fed pipeline, to its water treatment plant in Morris (see Figure 2.2). The PVWC stated that the goal is to develop both an emergency water supply that is not susceptible to drought, and a supplemental water supply. While the PVWC is applying for a license to withdraw and transport 50 litres per second of water, it stated that there was a potential 20-year future need of up to 300 litres per second. During the hearing, the PVWC took the position that the proposed Project was for a maximum of 50 litres. It also stated that given the higher cost of pumping and transporting water from the Sandilands, it is likely that in the future it would expand its treatment plant on the Red River at Morris rather than increase its supply from the Sandilands beyond 50 litres per second. Furthermore, the PVWC noted that additional approvals would be required before it could increase the amount of water it withdrew from the Sandilands. It also stated that it might sell water along the pipeline route, particularly in the area west of Provincial Trunk Highway 12. If this were done, it might also construct a water treatment plant in that area. The PVWC stated that given the fact that the Project was both a supplemental supply and a drought-relief supply, the PVWC would be using the Project on a year-round basis, at a rate of approximately 35 litres per second.

The proposed groundwater source is a confined aquifer in the glaciofluvial[2] sediments that underlie the Agassiz Sandilands Uplands. The aquifer is part of a nested aquifer series that form a complex that extends from the United Stated border to the TransCanada Highway and from the Bedford Ridge to Lake of the Woods. Given the predominantly sandy soils near the surface in the area, the PVWC concluded that

[1] A formation is a widespread type of rock bearing specific characteristics, usually named for the place where they are initially found.

[2] Glaciofluvial deposits are material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice.

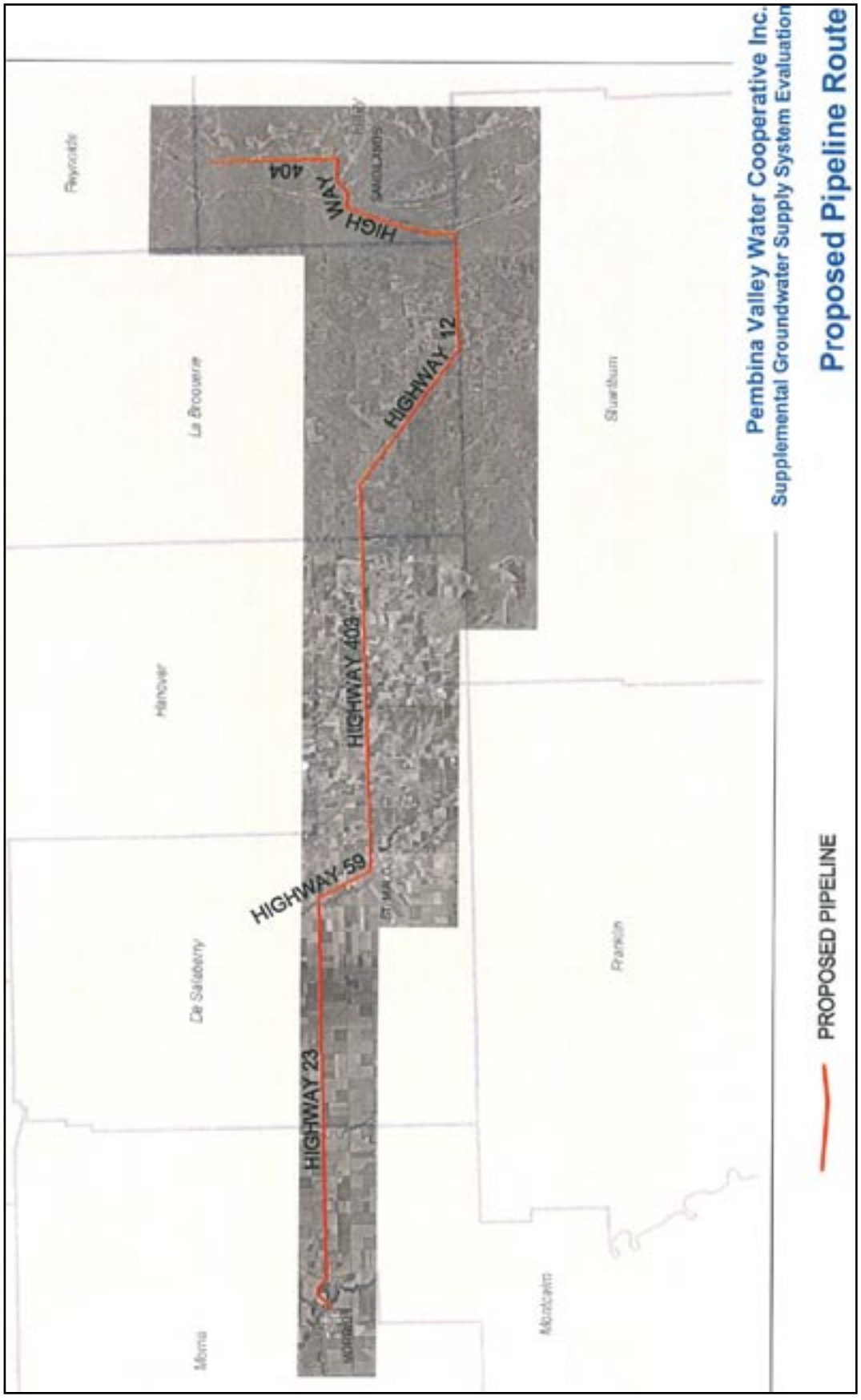


Figure 2.2 Proposed PVWC pipeline route

the infiltration rate of precipitation and the recharge to the aquifers is high. Regional drainage is poor: the St. Labre Bog lies in the east of the area, the Caliento Bog in the south, the Rat River Swamp in the southwest and the Brokenhead Swamp in the north. A number of drainage works, including the Davidson Ditch, have been constructed to enhance surface runoff.

The aquifer that the PVWC is proposing to develop lies in the Sandilands Glaciofluvial Complex (see Figure 2.3), a sequence of deposits that underlie the Bedford Hills/Whitemouth Lake Plateau with an estimated area of 1,935,000,000 square metres. The Complex extends in an arc from the TransCanada Highway south to the Piney area and then east to Middlebro. It is part of the Agassiz Sandilands Uplands, one of the three physiographic regions in southeastern Manitoba (the other two being the Lake Terrace Plain, and the Whitemouth Lowlands). The Complex includes portions of the drainages basins of the Rat, Seine, Whitemouth, Roseau, and Brokenhead Rivers. The Bedford Hills and the Bedford Ridge mark the western edge of the Complex, which reach an elevation of 390 metres above sea level.

The Sandilands, where the PVWC is proposing to place its wellhead, is one of two major sources of recharge to the bedrock aquifers that underlie Southern Manitoba. The PVWC, however, argued that the characterization of the region as a major recharge area for the bedrock aquifers "does not apply to all areas of the 'Sandilands'. In the case of the Sandilands Glaciofluvial Complex, previous researchers (Ferguson et al, 2003 and Cherry, 2000) have noted that the lower hydraulic conductivity of the till

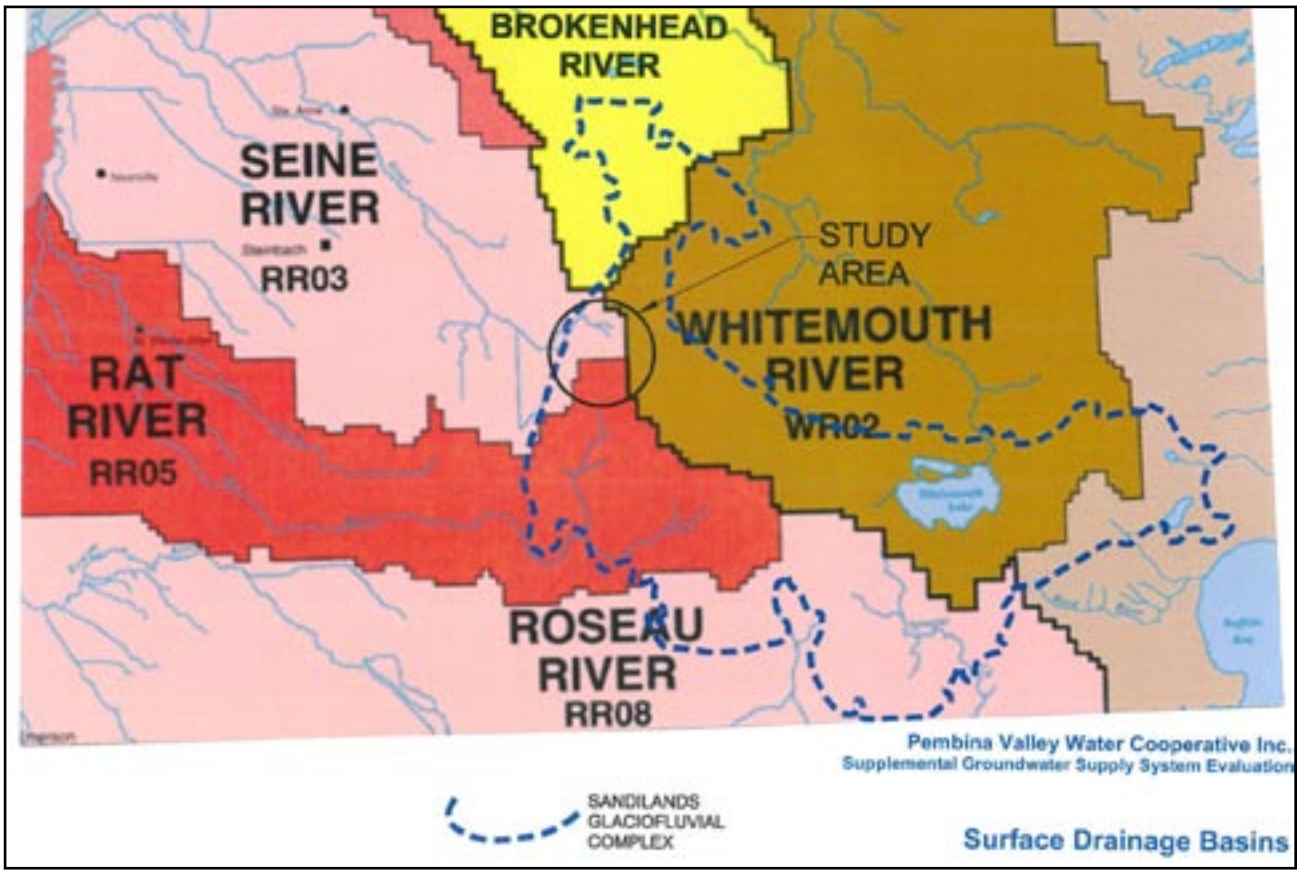


Figure 2.3 Sandilands Glaciofluvial Complex

unit underlying the Complex will control the recharge rate to the underlying bedrock aquifers."

2.3.1 Recharge

The PVWC used previous studies to make estimates about the rate of recharge to the Sandilands Glaciofluvial Complex. In its submission PVWC stated: "Cherry (2000) estimated recharge rates, using environmental isotopes, varying from 174mm/year in the sandy areas to 43 mm/year in the areas underlain by clay till." On this point the Commission notes that Cherry's work also states that "The lowest recharge rate, 43 +/-26 mm/yr, is actually a maximum value for recharge at site 9804 … If this value was not used in the calculation of the average recharge rate the value would be closer to 30 +/-8 mm/yr with a coefficient of variation of 25%" (Cherry, 2000, p.73). The Commission will return to this issue in its comments in Chapter Five.

Cherry also estimated a recharge rate for the entire Sandilands Glaciofluvial Complex of 71 millimetres per year. Given an estimated area for the complex of 1,935,000,000 square metres and a recharge rate of 71 millimetres per year, the PVWC stated that the estimated recharge to the Complex was 137,000 cubic decametres (a decametre or DAM is 1,000 metres, a cubic decametre is expressed as DAM^3). This is equivalent to a recharge flow of 4,300 litres per second. The PVWC also calculated the recharge rate for the recharge area upstream of the well head. The calculation used a recharge rate of 172 millimetres per year, which when multiplied by the recharge area upstream of the pumping well gave a volume of 14,000 cubic decametres per year or an equivalent annual recharge rate of 400 litres per second. The PVWC defined the recharge area as the eight-kilometre-wide zone stretching from the proposed pumping well east to the groundwater-flow divide (Figure 2.4).

2.3.2 Funding

The PVWC stated that it would be borrowing the money to pay the estimated $12-million cost of the Project and that no federal, provincial or municipal funds are going into the Project.

2.3.3 Public consultation

The PVWC conducted a limited public consultation process, which included the seven municipal governments in the vicinity of the proposed project. Meetings were also held with officials from six RMs. The PVWC stated that the only significant concerns were raised by the RM of Piney over the sustainability of the groundwater supply and the need for an environmental review. The PVWC stated that it concluded that neither the well-site construction nor operation was expected to have any socio-economic impacts.

2.3.4 The pipeline

The proposed 95.3-kilometre pipeline would run from the well site to the Morris water treatment plant. For most of its length it would follow Provincial Road (PR) and Provincial Trunk Highway (PTH) rights of way. The exception would be a portion of the route north of the Town of Sandilands. Its route would follow Provincial Road 404 south from the well site to a point one-kilometre north of the Town of Sandilands. From this point, the route would travel west one kilometre through an undeveloped forest until it rejoined PR 404 and followed it in a southwesterly direction to PTH No. 12. It is to continue west along PTH 12 to PR 403, continuing west along PR 403

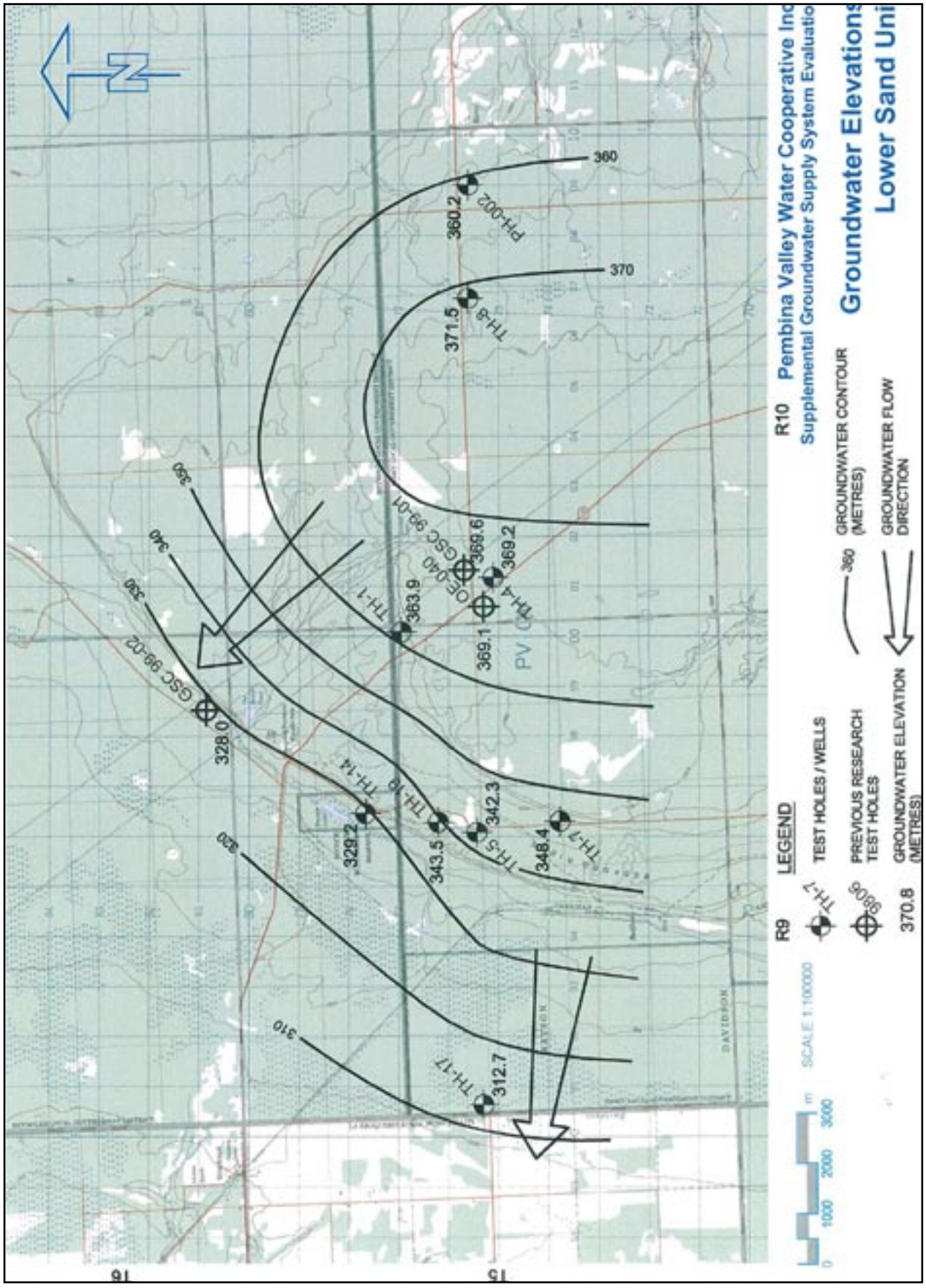


Figure 2.4 Groundwater elevaions Lower Sand Unit

to PTH 59, then travelling northwesterly until turning west at PTH 23, and continuing on to the Morris water treatment plant. There are 11 stream and river crossings on this route. The PVWC stated none of the watercourse crossings are considered critical fish-habitat according to Department of Fisheries and Oceans criteria.

The PVWC proposes using trenchless construction techniques such as horizontal direction drilling to reduce the impacts related to construction. To eliminate any potential impacts on spawning as a result of the introduction of sediment through this process, the PVWC committed to adhering to the Department of Fisheries and Oceans Operational Statement of Stream Crossings in Manitoba where High-Pressure Directional Drilling is Employed.

The PVWC stated that once the Project is completed, most of its environmental impact would come as a result of maintenance of the right-of-way, which is currently done by the Manitoba government. Maintenance of the right-of-way north of the Town of the Sandilands would be carried out in manner similar to roadside ditch mowing and was not expected to have a significant negative impact on wildlife.

The pipeline would be designed for working measures between 140 kilopascals and 525 kilopascals and would be 30 centimetres in diameter and be constructed of either polyvinyl chloride (PVC) or heavy-duty polyethylene (HDPE) and would be limited to a 50-litre-per-second maximum flow rate using a gravity feed system.

The PVWC's overall perspective on the construction of the pipeline was that it would be able to mitigate most potential environmental impacts through responsible construction and operation practices. It predicted that within a year of construction, the portion of the pipeline that follows rights-of-way would be returned to its current condition, which it described as a highly managed environment. The one-kilometre section of the route that travels through forest north of the Sandilands would be maintained in a treeless condition. However, because this is what the PVWC termed a fragmented area that is crossed with trails and forestry roads, it stated the impact on the environment, in a regional perspective, would be insignificant.

The PVWC stated that there would be no impact to groundwater quality as a result of the construction of the pipeline nor would there be any impact to surface water quality.

According to the PVWC there are no known occurrences of threatened or endangered species under either Manitoba's *The Endangered Species Act* or the federal *Species at Risk Act* on the route.

The PVWC expected the socio-economic impacts from Project construction would be minimal, the major ones being the relatively limited number of temporary jobs being created to construct the Project and the various delays, inconveniences and noise created during construction. The PVWC committed itself to minimizing these impacts. Construction equipment would have appropriate mufflers and work would be timed to be least disruptive of evening activities.

The clearing of the rights of way in the one-kilometre portion of the right of way north of the Town of Sandilands portion would be carried out after July 31 and before April 1 to prevent destruction of active bird nests, eggs, or young. In addition, there is a commitment to maintaining buffer zones around dens and nests. Riparian areas would be protected by setback zones beyond the high-water mark and the timing of construction at stream crossings to have minimal effects on the environment.

During construction it was thought that earth moving, vehicle exhaust, and dust from exposed surface could create temporary and localized impacts on air quality. The PVWC committed to meeting federal standards for control emissions and to exercise dust control measures during construction. It also committed to sorting and handling fuel, lubricants, and other potentially hazardous materials in dedicated areas in work camps and marshalling yards.

2.3.5 The well

The proposed well site is located eight kilometres north of the Town of Sandilands, immediately adjacent to Provincial Road 404. It is in the Sandilands Provincial Forest, which is part of the southern portion of Manitoba's boreal forest. There is no intention to have a full-time pump operator, and PVWC staff would attend the well only to carry out regular maintenance. The well would be operated by a submersible pump that was capable of pumping 50 litres of water per second at 400 kilopascals of pressure. The well and its controls would be housed in a single-storey building in an 18.3 metres by 18.3 metres fenced area. Figure 2.5 shows the location of the well and the surrounding geographical features. It also shows the location of test holes and monitoring wells.

The PVWC took the position that there would be no releases of pollutants into the land, air, or water during the operation of the well. During construction, dust, gas, and particulate emission would be controlled by watering and maintenance. To prevent spills, fuel or lubricants would be stored offsite. Any spills that did occur, and the PVWC stated that such spills would be small in size if they did occur, would be handled according to standard construction procedures and soil affected by the spill would be removed.

The PVWC noted that the site is next to a Provincial Road and machinery and humans are not uncommon in that location. As a result, while there would be short-term disturbances during construction, it did not predict any adverse affects on wildlife. Because the well does not target the upper, unconfined aquifer, the PVWC did not believe that the operation of the well would affect wildlife.

Since there are no surface water bodies in the area of the well site, the PVWC stated there would be no impact on aquatic habitat during construction. It also took the position that the withdrawal of groundwater would not have a significant effect on the water balance of local water courses and therefore aquatic habitat would not be affected.

The proposed well is situated on the Bedford Ridge approximately two kilometres to the east of the Watson P. Davidson, Wildlife Management Area and one kilometre to the south of the Pocock Lake Ecological Reserve. The Pocock Lake Ecological reserve is a 162-hectare reserve, established in 1982 and administered by Manitoba Conservation under *The Ecological Reserves Act*. It includes a large open-water marsh (Pocock Lake) and a gradation of vegetation from moisture to drought tolerant. Watson P. Davidson Wildlife Management Area was set up in 1961 under *The Crown Land Act* and covers 5,827 hectares of land. The closest communities to the well are Sandilands, Marchand and Kerry.

2.4 The impact of well operation on the aquifer and surrounding environment

The PVWC presented the Commission with the following conclusions regarding the impact of the operation of the Project on the

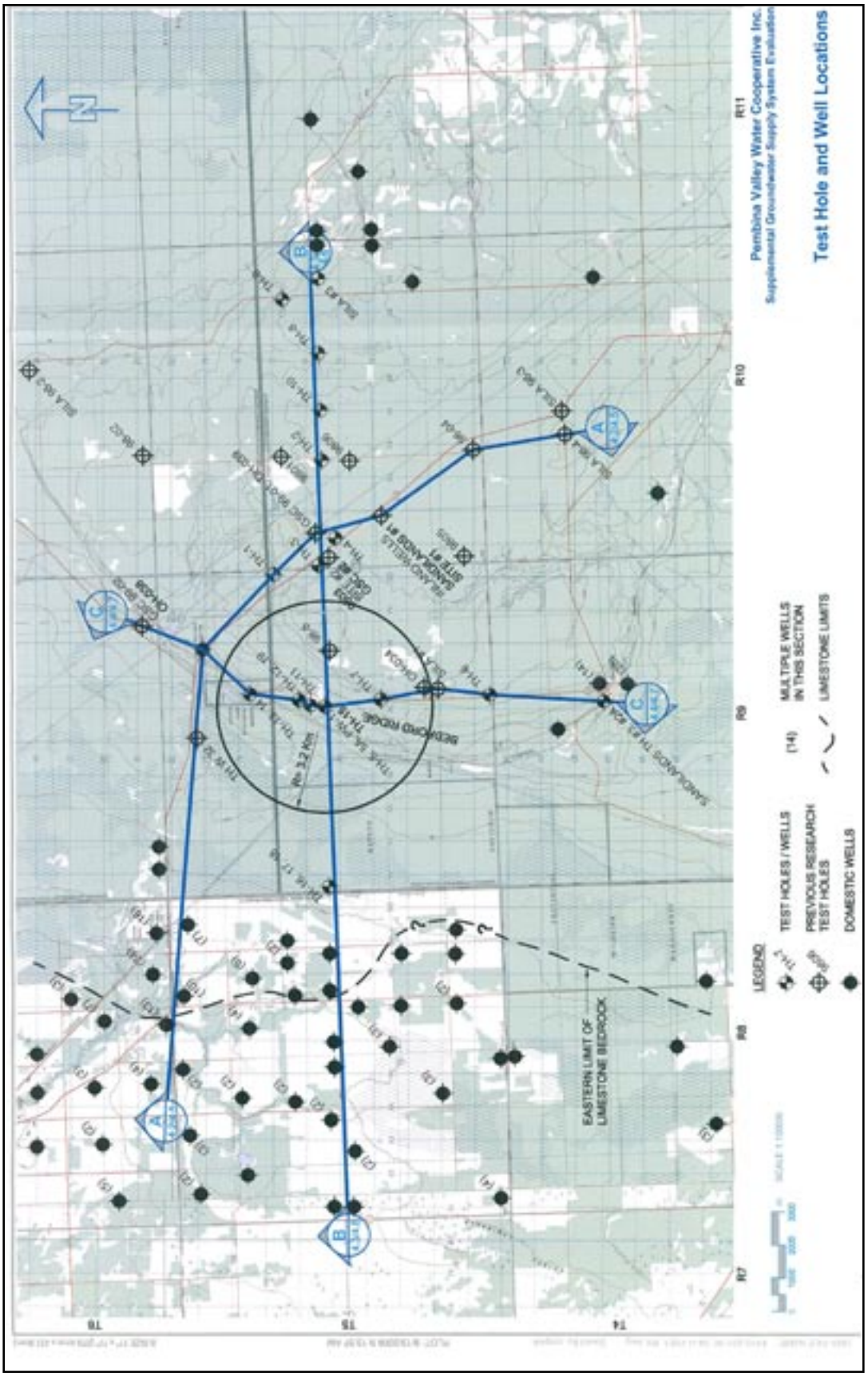


Figure 2.5 PVWC proposed well site and test hole and well locations. The proposed well site is in the centre of the circle.

aquifer and the surrounding environment.

- Based on the estimated rate of recharge for the targeted aquifer, the proposed groundwater withdrawal rate was sustainable. Therefore, there would be no depletion of the groundwater resource, nor changes in the water quality.
- The Project would not affect the water balance in the upper soil zone, and as a result there would be no adverse impact on surface vegetation or forest productivity.
- The Project would not affect the quality or quantity of supply to other groundwater users.
- Because the Project does not target the upper, unconfined aquifer, the operation of the well would not affect wildlife.
- The Project would not have a significant effect on the water balance of local water courses and therefore aquatic habitat would not be affected.

2.5 Placing the Project aquifer in context

In its description of the complex in which the aquifer that the PVWC proposes to develop lies in, the PVWC identified seven significant layers: the Upper Sand Unit, the Upper Silt Unit, the Lower Sand Unit (which contains the aquifer from which the Project is intended to withdraw water), the Lower Till Formation, the Red River Formation, the Winnipeg Formation, and the Precambrian basement complex. The following sections describe these units and formations, paying particular emphasis to groundflow, recharge, and discharge. (See figures 2.6 to 2.8 for a number of profiles of these layers in the Sandilands area.)

2.5.1 Upper Sand Unit

According to the PVWC, this unconfined aquifer extends from the surface to a depth of 30-40 metres in the uplands, and to a depth of 10 metres in the lowlands to the west of Bedford Ridge. According to test results, the unit is made up of very fine to coarse-grained sand with occasional gravel. Silty sand and discrete silt[3] units were also found, while clay was not seen as a significant component of the unit.

Because the Upper Sand Unit is exposed at the surface, precipitation infiltrates the aquifer throughout the area under study by the PVWC.

Groundwater flows to the west and northwest from a groundwater high of 384.8 metres (in the centre of the uplands) to a low of 310.4 metres on the lowlands west of Bedford Ridge. The water table in the unit ranges from a depth of 38.5 metres to 2.5 metres in the lowlands west of the Bedford Ridge but was rarely less than 5 metres. The PVWC concluded that direct interaction between the groundwater in the upper aquifer system and the surface environment was limited.

Water flows locally into such features as the Davidson Ditch area, intermediately from the uplands to the lowlands, or through the soils to the Lower Sand Unit. The PVWC noted that at the site of the proposed well there is a significant difference in water pressure between the Upper Sand Unit Water table and the Lower Sand Unit, suggesting that there was not a strong hydraulic connection between the two units in that area.

[3] Silt particles are smaller than sand particles and larger than clay particles.

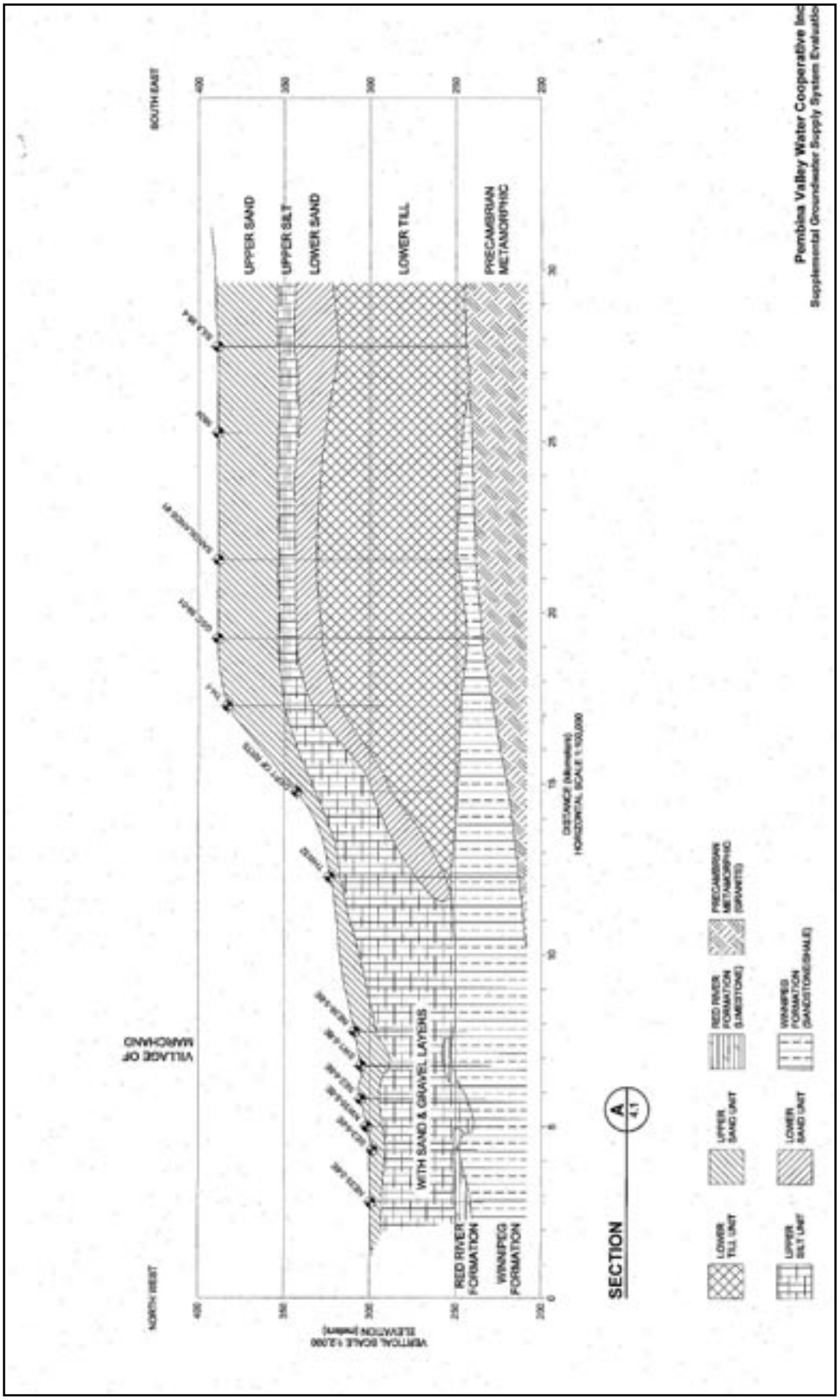


Figure 2.6 (Stratigraphy for section A in Figure 2.5)

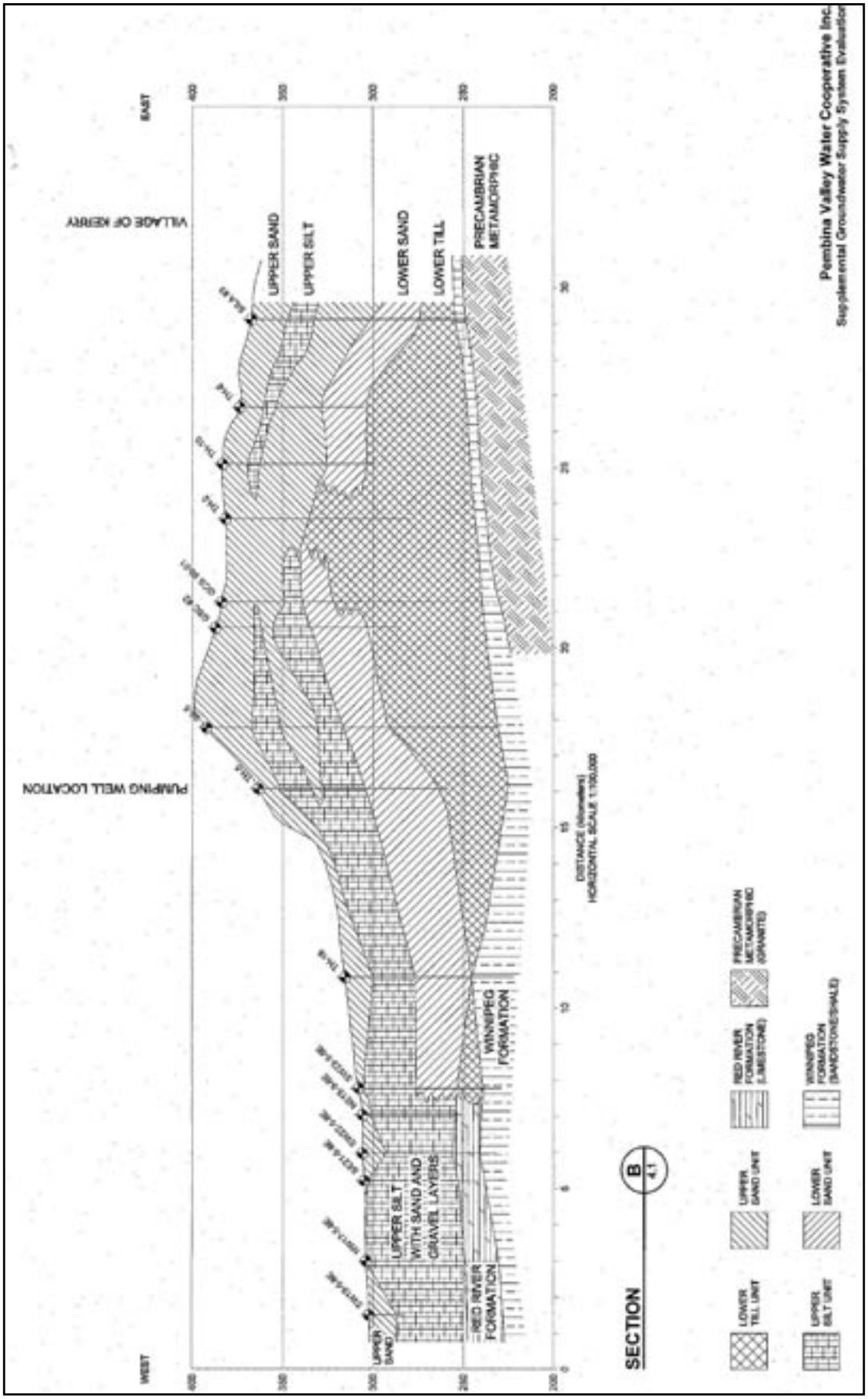


Figure 2.7 (Stratigraphy for section B in Figure 2.5)

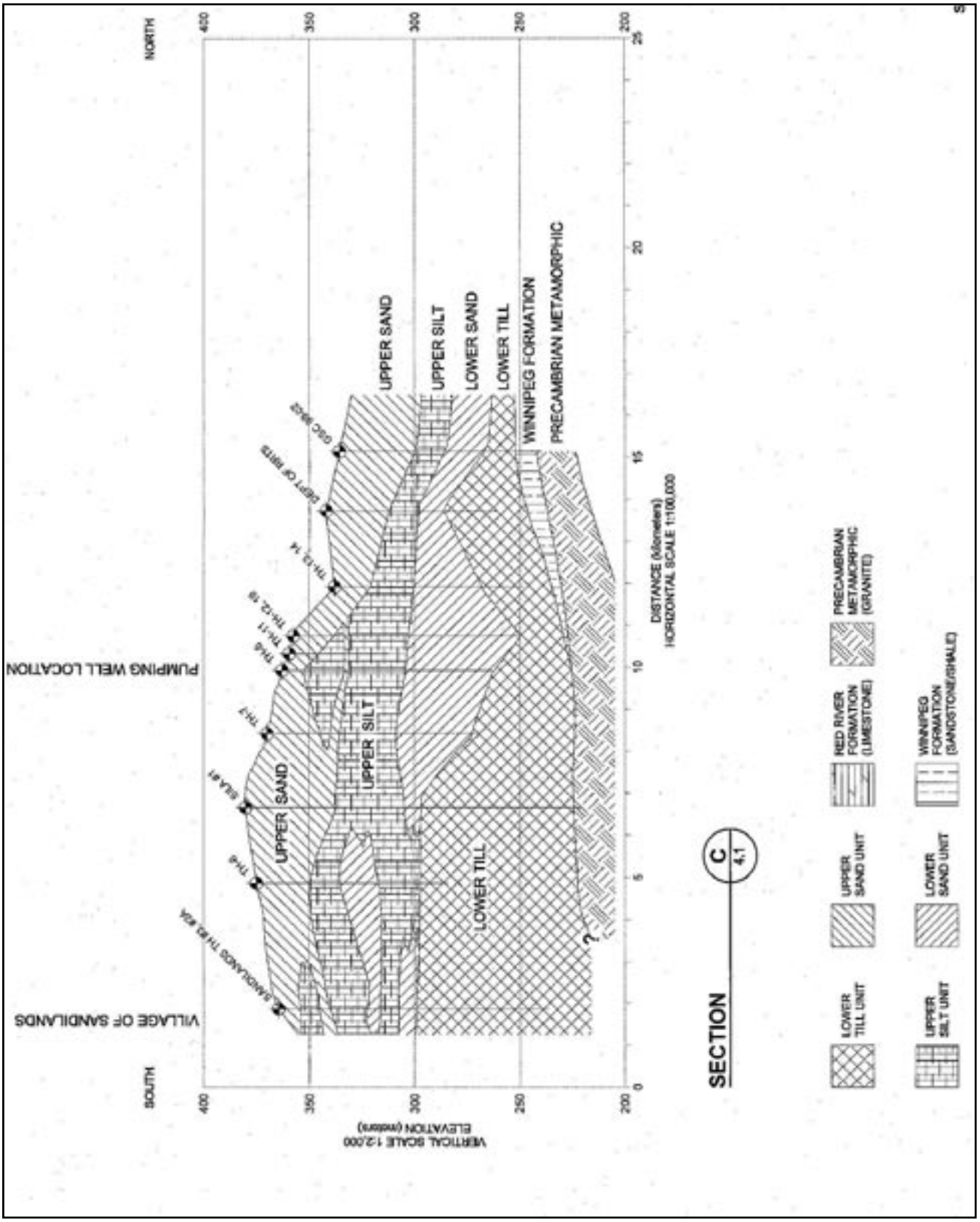


Figure 2.8 (Stratigraphy for section C in Figure 2.5)

2.5.2 Upper Silt Unit

This unit, made up primarily of silt mixed with some clay and sand, underlies the Upper Sand Unit. Due to its low rate of conductivity, it is considered an aquitard. The Upper Silt Unit plays a role in limiting the recharge of the Lower Sand Unit, although this role appeared to be variable according to the PVWC, with tests in one well area suggesting that the Upper Silt Unit is quite thin in that area and may be absent further east.

2.5.3 Lower Sand Unit

The confined aquifer that the PVWC Project proposes to draw water from is contained in what was termed the Lower Sand Unit, which was made up of fine to coarse sand with occasional gravel. This unit was estimated to extend to a depth of 70 metres, and in some locations to 100 metres. The PVWC stated that on the basis of the information available, the unit extended continuously to the east and southeast, but did not extend as a single discrete unit to the Village of Sandilands area nor to the northwest to the Village of Marchand nor to the west for a significant distance beyond the base of the Bedford Ridge.

The PVWC stated that groundwater flow in the Lower Sand Unit was to the west and northwest from a groundwater high of 371.5 metres in the centre of the Uplands to a groundwater low of 312.7 metres in the Lowlands west of the Bedford Ridge. The PVWC posits a groundwater divide in the area of well TH-8 (Test Hole 8) with water flowing to the east, west and north from that point (See figure 2.4). It noted that "limited information is available to the east, south, and north of TH-8 and further monitoring points may refine this interpretation."

According to the PVWC, recharge of the aquifer is likely the result of the cumulative effects of small amounts of infiltration through the Upper Silt Unit over a very large area, and potentially the infiltration of water from the surface to the east in the St. Labre Bog area where the lower permeability Upper Silt Unit is absent. It stated "The available information indicated that a significant portion of the recharge to the Lower Sand Unit occurs in the area of wells GSC [Geological Service of Canada] 9901, 9801 and 9806 where the confining Upper Silt Unit is thin or absent… No information is available to the south of wells TH-4 and TH-8, and therefore it is not known what contribution flow from the south might make to the Lower Sand Unit flow system."

The PVWC identified the following three possible pathway of discharge for the Lower Sand Unit aquifer.

- **Upward flow into the Upper Sand Unit.** Discharge into this unit would drain into the Davidson Ditch and other drainage courses in the area.
- **Lateral dispersion into confined sand-and-gravel layers downstream of the terminus of the Lower Sand Aquifer.** The PVWC stated that the Lower Sand Unit ended as a discrete unit near the base of the Bedford Ridge. From there it graded into a series of sand-and-gravel layers that contained less pervious materials. It was stated that quantifying the volume of water discharging to these layers would require long-term monitoring of the system's response to pumping.
- **Downward flow to the Sandstone Unit.** PVWC stated that further long-term monitoring is required to quantify recharge and the potential effects on the Sandstone Unit.

The PVWC was not able at the hearing to provide exact information on the discharge pathway or the storage of this aquifer. It stated that based on an assumption that the aquifer was in equilibirum, the discharge volume was equal to the recharge volume. The PVWC also testified that while it had determined the northern and southern extent of the aquifer, it had not determined its eastern and western limits.

2.5.4 Lower Till Formation

At a depth of approximately 70 metres, the PVWC reported a transition from the sand unit to what was described as till, clay, and silty clay or silt. It described this as the Lower Till Formation. The PVWC stated that the finer clays and silts would limit the vertical movement of water toward the underlying bedrock. It stated that the lower hydraulic conductivity of this unit, rather than any variation in the water levels of the overlying aquifers, would determine the recharge rate to the bedrock aquifers.

2.5.5 Red River Formation

The PVWC stated that the Red River Formation, which contains the Carbonate Aquifer, extends from the west to within five to eight kilometres of the Bedford Ridge and was not encountered by the PVWC test holes.

2.5.6 Winnipeg Formation

The sandstones and shale of the Winnipeg Formation extend under the Bedford Ridge Uplands, thinning out as the formation moves east (the PVWC often referred to this formation as the Sandstone Unit). There is a freshwater aquifer at this level, however it has an unstable saline-non-saline interface. The indicated groundwater flow in this unit is to the northwest from beneath the Sandilands Glaciofluvial Complex. The PVWC stated that this would suggest that recharge is occurring beneath the Complex, noting that a thick sequence of clay till beneath the Complex would limit the potential rate of recharge to the Sandstone Unit.

2.5.7 Precambrian basement complex

The Precambrian basement, at a depth of 125 to 150 metres, forms the basement rock of igneous and metamorphic rocks.

2.6 Impact of project on existing groundwater users

The PWVC identified three areas of existing groundwater users: Kerry, Sandilands, and Marchand. It felt that the Kerry and Sandilands wells were very unlikely to be affected by the proposed groundwater withdrawal: the Kerry wells being 14 kilometres east of the well and therefore on the opposite side of what it determined to be the groundwater flow divide, while it stated that the Lower Sand Unit does not extend south to the Sandilands area (which is eight kilometres from the pumping well).

The PVWC stated that 46 per cent of the wells in the area to the northwest in Marchand and in the agricultural area to the west of the proposed well draw their water from either confined sand-and-gravel aquifers or from the limestone and sandstone aquifers. Eight per cent draw water from the Upper Sand Unit. It is the PVWC's position that the aquifer that it is proposing to draw water from does not extend in a discrete unit for a significant extent past the base of the Bedford Ridge and that the sand-and-gravel aquifers that are being utilized in the Marchard area are not directly connected to the Lower Sand Unit.

As noted above, the PVWC concluded

that water flowing west from the Lower Sand Unit is likely to travel either upwards into the Upper Sand Unit, sideways into the sand-and-gravel layers and downward into the Sandstone Unit (although it stated that the recharge to this unit was limited). Given these conclusions, the PVWC concluded that the "withdrawal of groundwater from the Lower Sand Unit has the potential to affect groundwater levels within the aquifers utilized by the downgradient users." However, the PVWC also noted that well monitoring demonstrated that the affected area was also a recharge zone. It concluded that knowledge of the hydraulic connectivity of the different units is needed to resolve the relative contributions of recharge from the different areas. The PVWC stated that two well nests are part of the monitoring well network "designed to capture the necessary information on hydraulic connectivity of the various units, and the recharge/discharge relationships."

The quality of water in the regional aquifers is uniform. For this reason, the PVWC stated it did not anticipate that withdrawal of water through the Project would result in poorer quality water moving into the region.

2.7 Sustainability of the aquifer

In addressing the issue of aquifer sustainability, the PVWC discussed three important concepts: safe yield, water budgets, and modelling.

2.7.1 Safe yield

The PVWC noted that safe yield for aquifers was originally defined as "The limit to the quantity of water which can be withdrawn regularly and permanently without dangerous depletion of the storage reserve." The concept has been refined overtime, and according to the PVWC, the current view is that there is no constant safe yield value for any aquifer. Rather the safe yield depends on how the aquifer is developed (the number of wells, their placement, and pumping rates) and the way this development affects the groundwater's interaction with other elements in the hydrological cycle.

2.7.2 Water budgets

The PVWC stated many in the hydrological community do not accept the view that a pre-development water budget (statements of recharge, discharge, and storage) allows one to determine the safe yield for a specific aquifer. Such a view was, in the PVWC's opinion, an oversimplification since a pre-development water budget does not provide information on the source of the water pumped and only provides indirect information on the amount of water available annually. The PVWC also stated that a pre-development water budget does not take into account how the system would respond to pumping.

2.7.3 Modelling

The PVWC took the position that given the complexity of the Sandilands Glaciofluvial Complex numerical modeling techniques were of little value in simulating the response of the groundwater systems to pumping. A particular drawback to the use of modelling is the "lack of factual information on how the groundwater system responds to pumping over long periods of time." Since no such records are available for the aquifer, the PVWC states "the estimation of a safe or sustainable yield is considered unwarranted and imprudent at this time."

The records on the upper unconfined aquifer and the lower confined aquifer are limited. While one monitoring well in the Upper Sand Unit dates back to 1965, most

date back only to the mid to late 1990s. The wells in the Lower Sand Unit date back to the mid to late 1990s.

The PVWC argued that despite its decision not to provide an estimate of safe yield, a water budget, or modelling projections, the requested supply rate would not result in the depletion of groundwater in storage. It based this argument on its estimation of a recharge rate 14,000 cubic decametres per year or 400 litres per second. The proposed withdrawal rate of 50 litres per second represents approximately 12 per cent of the estimated recharge rate of 400 litres per second. The PVWC pointed out that "provincial policy for other aquifers such as the Assiniboine Delta Aquifer and the Oak Lake Aquifer has been to allow up to 50% of the estimated recharge rate to be allocated for use." In concluding its discussion on recharge, the PVWC stated that "Long term monitoring of the response of the aquifer to pumping would be required to confirm the recharge." The Commission addresses the issues of numerical modelling, water budgets, safe yield, and sustainability in Chapter Five of this report.

2.8 Monitoring and mitigation

The PVWC proposed a monitoring plan to ensure that the Project does not have an adverse effect on existing groundwater users, the environment, and the aquifer. It is also intended to obtain information on the vertical and lateral groundwater response to long-term pumping to allow estimates to be made of the sustainable yield of the entire Sandilands Glaciofluvial Complex. The program would include monitoring of both groundwater levels and quality. Groundwater samples would be collected annually and analyzed for routine water-quality parameters. For the first three months, information from the continuous groundwater level records would be retrieved monthly. The information would be used to compile a monthly report on water withdrawal rates, hydrographs of the groundwater levels at each well, and maps illustrating the drawdown effects. The reports would be submitted to Water Stewardship for review. After the first three months these reports would be prepared on a quarterly basis and submitted to Water Stewardship. An annual operation report would include all water withdrawal rate records, groundwater level monitoring data, and groundwater quality monitoring data for that year. The report would assess the results and, if necessary, make recommendations for change in the monitoring program. No changes would be implemented without approval of Manitoba Water Stewardship. The monitoring would take in provincial and PVWC wells in the Upper Sand Unit aquifer, the Lower Sand Unit aquifer, and the Sandstone aquifer. The PVWC proposed mitigation plans should its monitoring identify adverse effects for groundwater users, the environment or the sustainability of groundwater resources.

3. The Hearing

At the hearing, the PVWC made a detailed presentation outlining the Project, the rationale for the Project, its assessment of the likely impacts of the Project, and its monitoring and mitigation plan. This information, along with information in various documents submitted by the PVWC is summarized in Chapter Two. At the hearing, the Commission also heard from the Manitoba Eco-Network (the only funded participant in the hearing) and a number of additional presenters. Their comments are summarized in this Chapter.

3.1 Manitoba Eco-Network presentation

The Water Caucus of the Manitoba Eco-Network presented a brief in opposition to licensing of the Project. It pointed out that a number of different rationales had been advanced for the Project, including:

- emergency supply in a drought
- supplying water to new PVWC customers on the east of the Red River
- population growth in the PVWC area, particularly immigration from Germany
- population growth and the growth of the livestock industry

The Eco-Network brief stressed the importance and complexity of the Sandilands glaciofluvial complex, noting that it was at the source of five different watersheds and that parts of it serve to recharge two of the province's bedrock aquifers. It also said that it provides water to wetlands and bogs in an area that is rich in biodiversity.

The Eco-Network also sought to determine how the Project fit with Manitoba water policy, particularly the Manitoba government publication *Applying Manitoba's Water Policies*, the 2003 *Manitoba Water Strategy*, the 2006 *Water Protection Act*, and the 2006 amendments to *The Water Rights Act*. It pointed out that *Applying Manitoba's Water Policies* said "Groundwater development and utilization shall be managed so that long-term sustainability of aquifers is achieved and existing uses are not negatively impacted."

The Eco-Network also noted that *The Water Resources Conservation Act* prohibited removal of water from a water basin or sub-water basin. The Eco-Network believes that the Lower Sand Unit extends into the sub-basin of the Winnipeg River and that the Project was therefore transferring water to the Red River sub-basin, placing it in violation of *The Water Resources Conservation Act*.

The Eco-Network also referred to an RM of Piney bylaw that prohibited the removal of groundwater or surface water that originated in the municipality by bulk methods including pipelines.

The Eco-Network stated that the document *Applying Manitoba's Water Policies* states that "water use and allocation

decisions should ideally be made within the framework of integrated basin, watershed, and aquifer plans" and also noted that *The Water Protection Act* enabled such watershed planning. In summarizing its views on the issues specific to the Sandilands Glaciofluvial Complex, the Eco-Network stated that the Project was not in step with Manitoba's stated principles and objectives concerning groundwater, particularly in the light of government commitments to:

- aquifer sustainability
- protecting groundwater resources (he questioned whether PVWC had demonstrated that the Project would not compromise the ecosystem functions of the aquifer)
- protected areas networks
- sub-basin transfers
- the precautionary principle (he noted that the PVWC proposal did not consider implications of climate change)

The Eco-Network said that watershed planning has not started in the PVWC area, although there is a Winkler Aquifer Management Plan and a Stephenfield Lake Watershed Management Plan. These plans, it said, had only been developed in response to problems that had arisen with those resources.

The Eco-Network also stated that through its seat on the Red River Basin Commission the PVWC could work towards an in-basin solution to the water issues that it faces.

The Eco-Network questioned whether the Project might raise international issues, indicating that there was reason to believe that the Sandilands Glaciofluvial Complex extended into the United States. Given that the extent of the interconnectivity between the Lower Sand Unit that the Project is targeting and the entire complex is undetermined, it said the International Joint Commission should be made aware of the Project. It recommended that Manitoba make the negotiating of a minimum-flow agreement for the Red River a priority, adding that this might done through the IJC's International Red River Board.

A separate Eco-Network presentation focussed on three issues:

- the cost of the water from the Project
- demand for water
- land management

The Eco-Network estimated a ten per cent borrowing cost and a ten per cent operations and maintenance cost for the Project. On this basis, it stated that the cost of the Project water would be $1.40 a cubic metre at Morris. At that cost the PVWC should be able introduce demand-side management strategies that would allow it to develop more water security without building the pipeline or developing the aquifer. It said that this would involve what have come to be known at soft-path alternatives. The Eco-Network gave several examples of soft-path approaches including water-efficient appliances and fixtures, metering, bans on lawn watering, gray-water systems (which recycle water), and substitution of native groundcover for lawns. It also indicated that the PVWC should have given consideration to withdrawing water from brackish aquifers within the PVWC region and then treating the water through a desalinization process. (The PVWC stated that the Eco-Network's calculations over-estimated the cost of water at Morris and indicated a number of reservations about the cost-effectiveness and environmental consequences of desalinization.)

In essence, the Eco-Network recommended

that the PVWC consider itself in the water-conservation business, rather than the water-delivery business. The Eco-Network said that much of the land in the PVWC area had been developed to drain water out of the area. It said that the drainage system can be redesigned to recharge aquifers rather than move water out of the region. Finally, the community had to make decisions about the types of agricultural industry it attracts and develops, noting that just because an industry is profitable does not mean it is economical for the region.

The Eco-Network also stressed that the proposals should have included information on what the PVWC would have done if it were faced with the prospect of no new water, saying that "the 'no project' alternative is expected as a matter of course in any benefit-cost analysis and is required in most environmental impact assessments."

In concluding, the Eco-Network made the following recommendations.

- Establishment of a watershed authority and/or conservation district in the Morris River and Plum River watershed to develop a watershed plan.
- Integration of the community development planning and intensive livestock operation policies required under *The Planning Act* into the watershed planning process.
- Embedding of water conservation plans and schemes within community, watershed, and regional planning exercises.
- Formal designation of water sub-basin boundaries under *The Water Resources Conservation Act*.
- An independent determination of whether the transfer of water from the Lower Sand Unit aquifer in the Sandilands Glaciofluvial Complex constitutes a sub-basin water transfer.
- An independent legal opinion on the Piney bylaw.
- Provincial action on areas above the Sandilands Glaciofluvial Complex that are already under consideration as part of the Protected Areas Initiative.
- Provincial investment in study of the targetted aquifer, its interactions with other ecological services, its recharge and impacts deriving from climate warming.

The Eco-Network also called for higher standards of performance in the practice of environmental assessments (echoing a CEC recommendation made its 2005 report on the Red River Floodway expansion). It also urged the CEC to ensure that proponents responded to all legitimate public comments that are submitted during the assessment process. The Eco-Network concluded by saying that its preferred option would be for the PVWC to abandon the Project and implement a demand-side management program that was part of a sustainable water management strategy.

Manitoba Wildlands also submitted a written brief to the Hearing that dealt with both the merit of the Project and the approval process. Manitoba Wildlands took the position that the Project was not in step with Manitoba's water policies and legislation. In relation to the Project, the organization called for the establishment of additional protected areas in the region surrounding the aquifer and the need for regional watershed plans prior to the consideration of the Project. It also stressed the need for the PVWC to consider alternatives including conservation. On process issues, the organization called for the use of Environmental Impact Statement Guidelines in assessing such proposals,

urged the Environmental Assessment and Licensing Branch to ensure that proponents provide adequate information regarding projects, proposed improvements in the communication of information related to projects to the public, and proposed improvements to the Participant Assistance Program of the CEC. Manitoba Wildlands also identified what it viewed as potential conflicts in the applicability of *The Water Resources Conservation Act* and *The Water Rights Act*.

3.2 Other presentations

Representatives of the RMs of Grey, Morris, Montcalm, Stanley, Thompson, and Roland, the Village of St. Claude, and the Towns of Carman, Morris, and Morden, and the City of Winkler, (all PVWC cooperative member municipalities) made presentations at the Hearing in favour of the Project. The presentations stressed the following points.

- The fact that there are still unserviced domestic customers in the PVWC service area.
- The PVWC service area is continuing to grow. Domestic and industrial growth is currently limited by water supply.
- The fact that all municipalities meter their water deliveries and have no volume discounts.
- The region's water supply is vulnerable to drought and impoundment by users in the United States.
- In many RMs there are no wells that can supply potable water. In recent years boil-water orders have been issued in some PVWC RMs (not for water delivered by PVWC, but for water from other regional sources).
- No PVWC water was used for irrigation and little was used for livestock.
- Municipalities were considering requiring low-flow or low-volume fixtures to be installed in all new homes and considering incentives that would encourage people to convert existing fixtures to low-flow or low-volume fixtures. In Winkler conservation has been encouraged by regulating lawn watering, encouraging low-flow bath and kitchen facilities, and increasing water rates. Large volume water-use industries are not encouraged to locate in our communities.
- In response to unsustainable use, an aquifer management board and plan has been established for the Winkler aquifer.

One presenter also provided a history of the Red River Water Commission, a forerunner to the PVWC, which was set up in the late 1950s, in response to concerns over both water shortages and flood damages in the Red River Valley in southern Manitoba. The report made it clear that for fifty years communities in the area now served by the PVWC have given consideration to a wide variety of water sources.

The Commission also heard representations in opposition to the Project from representatives of the RMs of La Broquerie and Piney, which are proximate to the proposed well site. The La Broquerie representative stated that without guarantees that the Project would not deplete the aquifer for southeastern Manitoba, his RM was opposed to the Project.

The Reeve of Piney stated that because of its concerns over the diversity of the ecosystem, the RM has asked Manitoba Water Stewardship to undertake a comprehensive study of the region, including the mapping and designation of sensitivity zones, aquifers and their capabilities. While the province was receptive to the request, no studies have been undertaken. He said that he believed

the RM's bylaw prohibiting the bulk export of water from the RM was supported by the 2001 Supreme Court of Canada decision in *Spraytech v. Hudson*. The only sources of potable water in Piney RM are landowners' private wells. The RM is concerned about the potential impact of the PVWC project on local domestic water quality and supply (which comes from landowners' private wells), and possible impact due to intensive livestock development, processing of water, and increased demand for water by other communities and organizations. The Piney representative said "because the recharge capabilities of the Sandilands aquifer is unknown by the proponents or by the Province of Manitoba, we believe that the PVWC proposal threatens the water quantity, and thus, the way of life of our residents."

The Piney and La Broquerie presentations raised the following questions about the Project.

- Did the CEC have sufficient information to issue a license?
- Was PVWC going to use the water from the aquifer as a prime source of water?
- Would limits be placed on the amount of water that could be withdrawn from the aquifer?
- Is the province adhering to its sustainable development principles, given the level of knowledge that it has about the amount of water within the aquifer and the effects of pumping from the aquifer?
- Would the Project set a precedent for other large users extracting water from the aquifer?
- What guarantee was there that the Project would not have an adverse effect on the residents of Sandilands and their water supply and on the ecoystems dependent on the aquifer?

The manager of the Seine-Rat River Conservation District spoke in opposition to the Project. He said that the Project presented a risk to regional groundwater uses including such growing communities as Steinbach and La Broquerie, the agricultural industry in south-east Manitoba, and to local groundwater users in the Sandilands area. While he opposed the licensing of the Project, he said any license should include the following conditions.

- Limits on the period in which water can be pumped from the well.
- A requirement that the pump have a capacity of no more than 50 litres per second.
- A ten-year limit on any license.
- A requirement for a scientifically approved number of continuous groundwater level monitoring stations for the lifespan of the withdrawal. The technical design of the monitoring should remain the responsibility of Manitoba Water Stewardship, while the expenses should be covered by PVWC. All of the groundwater monitoring stations should be installed prior to the operation of the well. The PVWC should be required to create and distribute a progress report on the long-term monitoring program prior to the initial operation of the well.
- The Seine-Rat River Conservation District be involved in the longterm monitoring and data collection with the PVWC funding this involvement.

The Associate Secretary of the Manitoba Public Utilities Board (PUB) addressed the Commission on the PUB's role relating to

municipal utilities, the potential of PUB reviews of future PVWC rate proposals, and Board actions in the area of pursuing sustainability in relation to municipal rate increases. The PUB was concerned to know if the Project would affect the availability of a water supply now or in the future for other municipal water utilities. The PUB also noted that PVWC's plans to supply water to customers along the pipeline route could affect other utility rates. He also indicated that the PUB is taking an increasing interest in matters of water quality, sewage treatment, and sustainability of operation.

A member of the North American Stormwater and Erosion Control Association and the Mixed Wood Forest Society presented a brief in opposition to the Project that consisted of excerpts from the U.S. Geological Survey 1999 publication *Sustainability of Ground-water Resources* by William M. Alley, Thomas E. Reilly, and O. Lehn Franke. It touched on the various impacts that ground-water pumping can have on aquifers and surrounding environments, the impact of climate change on groundwater use, the role that water budgets and computer modelling can play in determining the impact of withdrawing water from a region, and the need for system-wide analysis.

One presenter said she was concerned by the certainty with which the PVWC had stated that the aquifer would be able to supply water on an indefinite basis. She said that she had attended an information meeting about the Project and had been left with the impression that the PVWC was prepared to sell water to communities that would be using the water for hog barns. Another presenter raised a number of concerns regarding the wisdom of tapping the aquifer without further study. She recommended the use of soft-path solutions, particularly demand management to reduce demand as opposed to increasing supply by developing the aquifer.

Correspondence to the Hearing from a retired provincial government groundwater official recommended that there be no licensing of a well or pipeline until a groundwater management plan was developed for the aquifer complex to the east of the Red River. The correspondent indicated that there were, in his opinion, numerous unanswered questions about recharge, regional groundwater usage, potential impact on the saline/freshwater boundary in the bedrock aquifer, the interconnection between the various aquifers in the region, and the adequacy of PVWC's approach to observation well layout, design and pumping tests. In addition, the correspondent suggested that the PVWC should have investigated the possibility of tapping brackish wells to the west of the Red River and then running the water through a desalinization process.

4. The Project in the Context of Manitoba Water Policy

The Commission believes it is appropriate to assess the Project in the context of the Manitoba government's water policies, which have been under development for nearly two decades. These policies have developed during a period of heightened concern over security of access to water, growing concerns over protection of water quality, and debates about the marketing of water. Key documents in this development process are:

Applying Manitoba's Water Policies (1990)
The Manitoba Water Strategy (2003)
The Water Protection Act (2006)

Three additional Acts that require consideration are *The Water Rights Act*, *The Water Resources Conservation Act (2000),* and *The Sustainable Development Act*. The following sections identify elements in each of these documents that the Commission believes to be applicable to the Project.

4.1 Applying Manitoba's Water Policies

Applying Manitoba's Water Policies was adopted in 1990. It was an outgrowth of the first Sustainable Development Strategy undertaken by The Manitoba Roundtable on Environment and Economy. The document identifies seven policy areas, three of which—Conservation, Use and Allocation, and Water Supply—are of particular significance to the Project under consideration. The next section of this report identifies specific policies identified under these sub areas and the steps to which the Manitoba government committed itself to implement these policies.

4.1.1 Conservation

Policy 2.1 states that "River, lake and shoreline habitat and the general environmental, subsistence, and economic values of rivers, lakes and wetlands shall, where possible, be conserved." To this end the government committed itself to:

- ensure that *integrated planning approaches* are used in resource management projects, whereby all potential impacts and opportunities affecting the water-related ecosystem are considered. [Emphasis added.]

4.1.2 Use and allocation

Policy 3.1 states that "Economic well being and sustainability shall be the goal in the allocation and utilization of Manitoba's water resources for consumptive and instream uses." To this end the government committed itself to:

- facilitate the identification of natural functions that extractive and instream uses must respect and ensure.
- ensure that water needed for ecosystem function is not allocated for uses that would threaten environmental sustainability.
- monitor water supplies and uses and under-

take enforcement, as necessary, to support use and allocation decisions.

Policy 3.2 states that "Water management priorities shall be determined through a *basin planning process* that takes into account the protection of potable water supplies, environmental integrity, existing commitments, and economic requirements."[Emphasis added.] The document went on to say:

> Any activity that changes the water regime in any part of a river basin or watershed will affect the water regime and related resources along lower reaches of the river basin or watershed and in underlying aquifers. Accordingly, *water use and allocation decisions should ideally be made within the framework of integrated basin, watershed and aquifer plans*. [Emphasis added.] Such plans would consider a number of factors within the basin or watershed, for example: existing and future uses of water; the soils, topographic, geologic, and other physiographic characteristics; the elements of water supply quality, and flow; the linkages between surface water and groundwater; land use; pollution hazard areas and other environmental sensitivities; and other resource opportunities and impacts, including environmental impacts.
>
> The river basin planning process, in its entirety, would encompass three levels of planning, *with the broadest level being basin planning, the second level being watershed and aquifer planning, and the third level being local planning*. [Emphasis added.] Basin planning would establish broad water and other resource management policies, objectives, and guidelines within the large river basin. Watershed and aquifer planning would establish more specific policies, objectives, and guidelines based on more localized characteristics, land and water activities, and on economic and environmental factors affecting the watersheds and aquifers. Local plans would be developed for implementation by local jurisdictions and would be in accordance with the policies, objectives, and guidelines established in the basin, watershed, and aquifer plans. Watershed and aquifer plans would be of greatest relevance to water use and allocation decisions.

One of the stated goals of this approach was to "To ensure that water management priorities are determined on a watershed-wide basis rather than only through site specific or single purpose planning." To this end the government committed itself to:

- use the river basin, watershed and aquifer planning processes to guide practical application of the water use and allocation priorities established in the *Water Rights Act*.

Policy 3.3 states that "Groundwater development and utilization shall be managed so that the long term sustainability of aquifers is achieved and existing uses are not negatively impacted." To this end, the government committed itself to:

- establish water quality objectives for all groundwater uses and apply these objectives to specific aquifers.
- maintain a comprehensive aquifer data base
- evaluate aquifers to define their location and dimensions, water table, flow dynamics, water quality, yield, pollution hazard areas

and inter-relationships with other aquifers, wetlands and stream flows.
- monitor changes in aquifer level and groundwater quality.
- monitor and regulate groundwater use:
  - to ensure that withdrawals do not exceed the sustainable yield of the aquifer, and
  - to support aquifer management guidelines and priorities established through the basin, watershed, and aquifer planning process.
- promote conservation of groundwater, through informational and water pricing initiatives, particularly in areas where the growth in the rate of use threatens to exceed the sustainable yield of aquifers.

Policy 3.5 states that "Transfer of untreated water across the Continental Divide (to or from the Hudson Bay drainage area) shall be opposed. Transfers from within the Hudson Bay drainage areas shall be minimized and only considered after a complete assessment of the environment, social and economic impacts on the donor and receiving basins."

4.1.3 Water Supply

Policy 4.1 states that "Demand management programs shall be implemented to conserve water and reduce the requirement for new water supply infrastructure." To this end, the government committed itself to:

- require that demand management options be explored and appropriate options be implemented before providing financial assistance to construct or improve water supply and wastewater handling infrastructures.
- promote the use of local land use planning that ensures that developments are compatible with water supply and wastewater handling capability.
- undertake, in cooperation with local authorities and the public, basin and watershed planning which includes the development of water supply strategies and identifies needs and opportunities for demand management and other water conservation measures.

Policy 4.2 states that "Irrigation, industrial and other development proposals involving direct or indirect water use shall consider impacts on existing and potential water uses as well as impacts on the environment." To this end, the government committed itself to:

- develop and maintain comprehensive water supply and use monitoring networks to facilitate water supply and use planning and water allocation decisions.

Policy 4.3 states that "The cost of developing, operating and maintaining the water resource infrastructure shall be apportioned among the beneficiaries in accordance with their share of the benefits." To this end, the government committed itself to:

- undertake in cooperation with other levels of government and water user groups, planning and economic studies and strategies which consider:
  - all practical water supply and wastewater management options
  - all potential water uses and user groups
  - potential environmental impacts and
  - costs and benefits specific to various water use categories.

Policy 4.4 states that "Pristine and potable water sources shall be afforded special attention." To this end, the government committed itself to:

- identify, through basin, watershed, and aquifer planning and through other water management studies and strategies, present and future drinking water needs and sources of supply.

4.1.4 Comment

To briefly summarize, *Applying Manitoba's Water Policies* sets out a series of areas of concerns and identifies appropriate strategies to address these concerns. Key themes are:

- the importance of integrated planning at the basin, watershed, and local level
- the importance of ensuring that the implications of water usage decisions on ecosystems are understood and respected
- the importance of fully evaluating groundwater resources
- the importance of a complete assessment of the environment, social, and economic impacts on the donor and receiving sub-basins in the case of intra-basin transfers
- the importance of linking land-use planning with watershed planning to ensure that development plans and water-supply plans are coherent
- the importance of demand management in water policy
- the importance of making water-use and allocation decisions within the framework of integrated basin, watershed and aquifer plans

4.2 Manitoba Water Strategy

Manitoba's Water Strategy was published in 2003 and serves as an update to *Applying Manitoba's Water Policies* (for example, it reprints the 1990 policies at the back of the report).

The document commences by embracing the concept of watershed planning, stating that "we must take a long-sighted and flexible approach to water management and ensure that we approach decision making in the context of the whole watershed." It goes on to say:

> Watershed planning requires both a comprehensive and co-operative approach to managing water issues and, as such, has already had a long history in Manitoba through our many Conservation Districts. Conservation Districts work at the local level with all community members to revitalize waterways and manage water control structures. The growth of these districts from nine to 16 in just the past three years demonstrates the increasing commitment of Manitobans to sustainable watershed planning. We must build on that commitment—as governments, communities and individuals—to develop watershed plans across the province.
>
> Step one is the development of province-wide benchmarks, through policies, guidelines and legislation, for sustainable water withdrawals, water retentions, and treated effluent discharges will ensure the integrity of watersheds ecosystem. Co-operative water management efforts, in partnership with all stakeholders, will be required to implement effective solutions dependent upon the uniqueness of each watershed. All of these

mechanisms must reflect the principles and guidelines of sustainable development and be supported through legislation, providing an overall regulatory and management framework.

...It is important that future actions take a comprehensive watershed-based approach in order to manage Manitoba's water in a sustainable manner. By implementing watershed based planning, we are better prepared to address current issues and anticipate water problems on the horizon."

In this spirit the document commits Manitoba to "Further protect water quality through *integrated planning of watersheds, aquifers and basins*." [Emphasis added.]

As with *Applying Manitoba's Water Policies*, *Manitoba's Water Strategy* has separate sections for Conservation, Use and Allocation, and Water Supply. The following is a listing of the Manitoba government commitments under these headings that are relevant to this project:

4.2.1 Conservation

- Research and develop better scientific tools to ensure ecological integrity is maintained.
- Develop a watershed planning framework and guidelines that have conservation has a priority, consistent with the principles of sustainable development.
- Improve our development and maintenance of information on Manitoba's groundwater resources.

4.2.2 Use and allocation

- Recognize and include all uses and users, including Aboriginal people, into aquifer, basin and watershed planning and management.

4.2.3 Water supply

- Develop a plan for water storage options, including maintenance of existing facilities and wetland retention, as part of broad-based water planning in Manitoba.
- Consider demand management techniques and principles for managing water supplies.
- Incorporate water supply issues into watershed based planning.

The document concludes by describing a three-point implementation framework for *Manitoba's Water Strategy*. The first point is the development of an integrated water planning and management system. The document states "*Integrated water planning and management is a public policy priority for the government of Manitoba*." [Emphasis added.]

Planning at the basin, aquifer, and watershed levels has occurred to varying degrees in the province for more than a decade. The components of the framework reflect successes from past experience and new requirements based on our increased understanding of the complexity of the environment and challenges of the future.

Planning and managing resources and activities on the basis of watersheds, basins and aquifers is supported by Manitobans as voiced through public consultation processes. The government, through its commitment to sustainable development, has made it clear

that responsibility for water management is shared by all Manitobans. *At the same time, the provincial government will provide a lead role to guide water management by working to create watershed districts across the province*. [Emphasis added.]

...Watershed plans must also be flexible to develop an integrated approach between provincial, basin, watershed, conservation district, aquifer, planning district, First Nation and large scale land and water use plans.

4.2.4 Comment

As can be seen, *Manitoba's Water Strategy* builds on *Applying Manitoba's Water Policies*, continuing to stress the central role of integrated water planning of watersheds, basins, and aquifers. Furthermore, it states that this planning must be consultative, and must be in keeping with the principles of sustainable development.

4.3 *The Water Protection Act*

The Manitoba Water Protection Act is the legislative expression of *Manitoba's Water Strategy*, creating a legislative framework for watershed planning. The *Act* states that the Manitoba government "is *committed to watershed planning* as an effective means to address risks to water resources and aquatic ecosystems and believes that *residents of watersheds should be consulted when watershed plans are developed*." [Emphasis added.] The *Act* also identifies:

(b) the importance of comprehensive planning for watersheds, with respect to water, land and ecosystems, on a basis that acknowledges and considers their interdependence

(d) the importance of applying scientific information in decision-making processes about water, including the establishment of standards, objectives and guidelines

(e) the need to protect riparian areas and wetlands

Under the *Act*, the government may designate watersheds and their boundaries and designate a water planning authority for a watershed (which may be a conservation district board, a planning district board, a municipal council, any other entity or mixture of the above). The government can also set a date for establishing a plan and provide the terms of reference for a plan. Watershed plans under the *Act* must consider the following:

- water quality standards, objectives and guidelines that apply to the watershed
- whether a water quality management zone is included within any part of the watershed
- studies that the authority considers relevant relating to water, land use, demographics, the capacity of the environment to accommodate development, and any other matter related to present or future physical, social or economic factors
- comments received through public consultation or public meetings
- prescribed water management principles
- relevant provincial land use policies, development plans, and zoning by-laws
- any other information that the authority considers relevant

Plans must also identify issues relating to the protection, conservation, or restoration of water, aquatic ecosystems and drinking water sources in the watershed. These might include protection of drinking water sources, pollution control, drainage and flood

control, water-demand management, supply of potable water, and emergency response. Plans are expected to create links between water-management and land-use planning and develop strategies for implementation, monitoring, and evaluation.

The public consultation process required in the establishment of the plan is also set out in the *Act*. Provision is made for a fund to support research, projects, and activities, grants to assist in the implementation of watershed management plans, or support any other water management or water quality purpose the government thinks appropriate.

In the event of a serious water shortage the Minister may declare "a serious water shortage in respect of all or part of Manitoba" and "take any action, make any regulation or issue any order that in his or her opinion is necessary to prevent, minimize or alleviate the water shortage." These orders take precedence over *The Water Rights Act*.

4.3.1 Comment

The Water Protection Act is consistent with both *Applying Manitoba's Water Policies* and *Manitoba's Water Strategy*. It establishes a legislative framework for creating the watershed plans that were identified as central to policy implementation as early as 1990. It highlights a number of issues that are of relevance to the Project, including the need for:

- study of the capacity of the environment to accommodate development
- public consultation
- prescribed water management principles
- the protection, conservation or restoration of water, aquatic ecosystems, and drinking water sources in the watershed
- water-demand management, water-use practices and priorities, the conservation of water supplies, and the reduction of water use and consumption during droughts and other periods of water shortage
- the supply, distribution, storage and retention of water, including measures to ensure persons in the watershed have access to clean potable water

4.4 *The Water Rights Act*

The Water Rights Act states that all water rights are vested with the Government of Manitoba. The general principle in granting rights is "first in time, first in right" (the rule of prior appropriation). Licensees are expected to monitor and report on their use to the province.

Water Rights are allocated in the following priority:

1. domestic purposes
2. municipal purposes
3. agricultural purposes
4. industrial purposes
5. irrigation purposes
6. other purposes

Licenses for a lower priority may be rescinded if a higher priority use is needed, for example, irrigation can be cancelled if water is needed for municipal purposes. The former license holder is compensated for his or her loss.

4.4.1 Comment

The PVWC has applied for an *Environment Act* license, to be issued by Manitoba Conservation, based on the volume of water to be withdrawn. To withdraw the water, a Water Rights license, issued by Manitoba Water Stewardship under *The Water Rights Act*

is also required. Decisions on both or either of these licenses should be made in respect of integrated watershed plans that include an assessment of all uses and future needs and impacts. The Commission is of the opinion that these decisions need to be carefully weighed, using due caution and should not be solely based on first-in-time, first-in-right to the water supply. The Hearing did not explore in detail issues related to *The Water Rights Act*. Given the ongoing concern over issues of water quality and water security, coupled with growing use of groundwater for agriculture and other purposes such as geothermal heating, the Commission recommends that the government undertake a further review of its policies and regulations in relation to water extraction and allocation.

4.5 *The Water Resources Conservation Act*

This is a very brief act, dealing largely with out-of-province sale of water. Its opening clauses make the following points:

> AND WHEREAS it is desirable to establish a water resource management scheme that will ensure that removal of water from Manitoba's water basins is not done in quantities that could, individually or collectively, have significant adverse effects on the ecological integrity of Manitoba's water resources or their associated ecosystems;
>
> AND WHEREAS, in light of the fact that future domestic needs and the potential effects of climate change are unknown, such a scheme should be based on the precautionary principle and on sustainable water resource management practices;

The Act states that:

> No person shall
>
> (a) drill for, divert, extract, take or store water for removal;
>
> (b) sell or otherwise dispose of water to a person for removal;
>
> (c) convey or transport water for removal; or
>
> (d) remove water;
>
> from a water basin or sub-water basin.

In the *Act* "water basin" is defined as the Manitoba portion of the Hudson Bay drainage basin and "sub-water basin" as a part of the Manitoba portion of the Hudson Bay drainage basin.

4.5.1 Comment

During the Hearing the Commission was told that this *Act* was essentially intended to halt exports of water over the continental divide. It was also argued before the Commission that the Project violates the *Act*. The Commission's view is that this is a transfer of water within a basin. However, the Commission is mindful of the fact that Manitoba legislation favours "a water resource management scheme" that is "based on the precautionary principle and on sustainable water resource management practices."

4.6 *The Sustainable Development Act*

The Commission was also mandated to review the Project in light of the Principles of Sustainable Development and Guidelines for Sustainable Development contained in *The Sustainable Development Act*. Those Principles and Guidelines are printed in Appendix B of this report. Those principles call for an integration of environmental and health decisions in a framework that recognizes a responsibility for stewardship of the

environment.

Of particular relevance to the issue at hand are the principles that stress the need for preventative approach to decision-making and the harvesting of resources on a sustainable yield basis. Relevant guidelines are those that stress proper resource pricing, demand management and resource allocation; public participation; integrated decision making; and research and innovation.

These principles and guidelines are all consonant with the Manitoba water policies that stress the importance of integrated watershed and aquifer planning, demand management, the use of alternate sources of water, and the preservation and protection of existing eco-systems.

4.7 Implementation of the above policies

Over the past two decades Manitoba has developed a comprehensive set of water policies, strategies and laws. A constant theme has been the centrality of integrated watershed planning in implementing these various policies and strategies. The government approach has been for Conservation Districts to take on the role of watershed planning authorities. Conservation Districts are led by local boards that have been jointly sponsored by the Manitoba government and local municipalities. They are responsible for improving soil, water, and wildlife management within specific regions, which are based on municipal boundaries although there is an effort to divide the districts into sub-districts along watershed boundaries. There are 18 Conservation Districts in Manitoba.

Conservation districts clearly have an important role to play in the water management process in Manitoba. However, *Applying Manitoba's Water Policies* identified three levels of planning: basin planning, watershed and aquifer planning, and local planning. While conservation district boundaries are "usually based on the drainage basin or watershed of the major river in the area" no conservation district encompasses a complete basin or sub-basin. (There are ten major drainage basins in the province.) Furthermore, many rural municipalities in the same watershed are either members of different conservation districts or do not belong to any conservation district. For example, of the RMs in the PVWC, Thompson and Stanley are members of the Pembina Valley Conservation District, Dufferin and Grey are in the LaSalle-Redboine Conservation District, while Franklin, Montcalm, Morris, Rhineland and Roland are not part of any conservation district. In southeastern Manitoba, there are only two conservation districts: Cooks Creek and Seine-Rat River. Virtually all of these RMs are in the Red River drainage basin. While conservation districts have done work on water-related plans, none to date has prepared the sort of watershed plans described in *The Water Protection Act,* or described in Manitoba water policy and strategy documents. While there are aquifer plans for a number of provincial aquifers, including the Winkler Aquifer, the Assiniboine Delta Aquifer and the Oak Lake Aquifer, there are no established aquifer plans for the aquifers in southeastern Manitoba.

While *The Water Protection Act* was only recently adopted, the provincial commitment to watershed planning on a broad basis has been in place for at least 16 years. The Province's decision to largely depend upon the conservation districts to provide watershed planning does not provide the breadth, coordination, and consistency with other provincial programs that is required.

Conservation Districts are well placed to facilitate local planning for smaller watersheds but the province should be taking the lead in providing the regional framework into which these local plans should fit. In review of the current project two major concerns are raised: 1) conservation districts are not established throughout most of the Red River Basin, and 2) there is no regional or basin plan to guide the development of local watershed/aquifer plans.

4.8 Provincial explanation of the degree of integration of aquifer planning and watershed planning

The Commission was told during the Hearing that over the next ten years the province will develop a watershed management plan for each watershed in the province. During this process, the Groundwater Management Section of Manitoba Water Stewardship will carry out regional groundwater mapping and revise existing regional groundwater maps on a watershed basis, looking at such matters as age of the groundwater and geochemistry of the groundwater. This was expected to lead to a greater integration of surface and groundwater issues.

The Commission questioned provincial government representatives about how groundwater management was integrated into provincial water strategy. It was told that from a studies point of view, the Groundwater Management Section's role is to broadly examine and develop an understanding of all the aquifers in the province. This would include determining how aquifers and aquitards interrelate, groundwater/surface water interrelationships, groundwater quality, and groundwater distribution within aquifers and aquifer systems. The province also carries out studies that allow it to work towards an understanding of sustainable groundwater withdrawals from aquifers.

Approximately 550 active groundwater-monitoring stations monitor both water levels and water quality in both wells that are influenced by pumping and others that are not developed. The province has also recently started to develop two and three-dimensional modelling systems. Through this modelling the information on the hydrogeology and the geology of aquifers will be integrated into one system. It was estimated that in ten years time the province will have developed mathematical models for a number of aquifer systems. Such models will become the primary tool for groundwater management over large areas, or within larger aquifers. However, the Commission was told that it will be quite a number of years before they can use the model in a predictive capacity.

The province is developing a regional groundwater model that covers the area from the Capital Region to slightly east of the Sandilands. The information going into this model would include:

- geology
- the hydraulic properties of aquifers and aquitards
- information on recharge and discharge
- surface water boundaries
- surface water bodies
- wetlands, rivers and creeks
- groundwater withdrawals (how much water is licensed for withdrawal in various places
- groundwater quality boundaries

When the Commission asked the government representatives about the integration of aquifer planning and watershed planning, it was told that because aquifers do not follow watershed boundaries all planning

done by Groundwater Management to date has been on an aquifer basis.

4.9 Commission comment on the Project and water policy

The Project rationale underscores the need for an integrated watershed and aquifer plan for the entire Red River basin. The Project is driven by concerns over drought created water shortages, the need to service existing demand in the PVWC region, and the need to service future growth-related demand. Watershed plans are intended to address such issues as the supply of potable water, demand management, and growth rates and the capacity of the environment to incorporate development. While it is very clear that the PVWC members are water conscious and have comparatively responsible price and watering policies (quite likely some of the most responsible of such policies in the province), the issues that are facing its member communities are all issues that ought to be addressed in an integrated watershed plan. The Commission is also aware of the fact that the PVWC was established out of a recognition that there was a need for a long-term regional response to drought and water-shortage problems that had been previously addressed on an ad hoc basis. The province can play a role in facilitating more in-depth investigation into alternatives including desalinization and surface water capture. Both the federal and provincial government need to continue efforts to ensure the negotiation of a minimum-flow agreement for the Red River.

While issues of development and drought are not as pressing in the Sandilands region, there exist a number of strong arguments that a watershed plan should be put in place before development goes ahead. All of the above planning documents call for local participation. All those who appeared before the Commission from the Sandilands region were hostile to the Project. While their concerns might be misplaced, and the Project might have no negative impact on their groundwater supplies, to approve this Project with no local support would appear to be at odds with Manitoba's water policy. While the Commission hearing process does allow for public involvement, it is not, however, a planning process.

The need for an integrated regional watershed and aquifer plan coupled with the issues related to the target aquifer and the Sandilands Glaciofluvial Complex discussed in Chapter 5 of this report provide sufficient reason for taking a precautionary approach to the development of this aquifer.

The Commission does not accept the view put before it during the hearing that because aquifer and watershed boundaries do not conform to one another, aquifer planning can go forward without watershed planning. When the boundaries of surface and sub-surface systems don't correspond, analyzing the system becomes more complex, but this should not negate the need for the analysis. The surface and groundwater planning arms of government need to work together in developing watershed plans that integrate surface and subsurface water resources.

5. Aquifer Sustainability

The previous chapter contained an outline of Manitoba government water policies. These policies stress the importance of the development of integrated watershed and aquifer plans. The key concern of any such integrated aquifer plans is aquifer sustainability. Ideally, such plans should be based on a watershed model that can integrate aquifer processes with watershed processes and simulate the aquifer's response to both pre-development and development conditions within its watershed. If this is not possible, then at a minimum a predevelopment average annual water budget and the safe and sustainable yield for the aquifer must be established. The PVWC provided little information in this area.

This chapter starts with a brief description of these concepts and then discusses the PVWC Project in reference to these measures.

5.1 Modelling aquifers

Models are mathematical tools used to simulate the workings of complex systems and predict how these systems react to changes. There are many types of models used by water resource engineers, depending on the nature of the resource, data available and results desired. Three types of models are appropriate to a discussion of aquifer planning: conceptual models, computational models, and integrated watershed models. These three models do not represent alternative approaches, instead they represent increasingly complex approaches that build upon the previous model.

5.1.1 Conceptual models

A conceptual model identifies and links the major components of a complex natural system. In the case of an aquifer, a water balance (described below) is a conceptual model that shows how water enters the aquifer, flows through the aquifer, and leaves the aquifer. The sustainable development of an aquifer requires that these interactions are understood so that a sensible management policy can be envisioned and practiced.

5.1.2 Computational models

A computational model takes each component of the conceptual model and describes it with mathematical equations. For example, water flow through an aquifer can be simulated by applying Darcy's equation (a law that describes fluid movement through a porous media) to this component. Through a process of continuous adjustment based on the comparisons of model results with historical monitoring records, a computational model for each component of the water balance is verified, validated, and calibrated.

5.1.3 Integrated watershed models

Water movement within a watershed involves water transfers between many water

resource elements: streams, wetlands, lakes, vadose (unsaturated) zones, and aquifers. An integrated watershed model links the computational models that describe each element into a comprehensive computational system that can be used to simulate the movement of water and other substances in the watershed.

5.2 Water balance and water budgets

The water balance model provides an ideal framework for viewing the dynamics of an aquifer because it can describe interactions between the atmosphere, ground and subsurface. The water balance for an aquifer before development is conceptualized in Figure 5.1a. This is usually stated mathematically as $R - D = \Delta S$ and is called the water balance equation. In this equation R is recharge, D is discharge for a given time period, and ΔS is the change in storage.

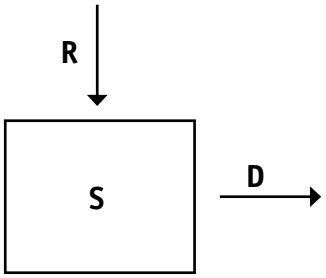


Figure 5.1a. The water balance for an undeveloped aquifer. R is recharge, D is discharge and S is the storage.

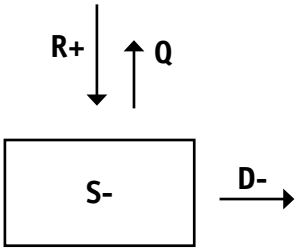


Figure 5.1b. The water balance for a post-development aquifer. R+ is the new recharge, D- is the new discharge, S- the new storage, and Q is pumpage.

Before development, the aquifer is considered to be in a state of dynamic equilibrium, where the average recharge and discharge over a period of time are equal and the storage S is constant.

This predevelopment phase can be depicted by a water budget. A water budget is, essentially, a snapshot in time of the water balance equation. Water budgets are not uncommon in Manitoba aquifer planning: the Winkler Aquifer, the Assiniboine Delta Aquifer and the Oak Lake Aquifer Plans all include water budgets that quantify the average annual recharge, discharge, and storage.

The aquifer's response to development (that is, pumping) is a change in all three of the water balance components (Figure 5.1b). This adjustment can take a long time, and is usually measured in the order of decades. Initially, groundwater pumped from the aquifer will come from storage, but as the aquifer adjusts, it will also come from increased recharge and decreased discharge until a new dynamic equilibrium condition is reached. The pumped amount Q is equal to the combined changes in the other three components, the decrease in storage and discharge plus the induced increase in recharge. This new equilibrium condition is difficult to predict.

Integrated watershed plans that employ computational models that simulate aquifer dynamics, calibrated for the watershed in question, are useful tools for predicting changes to the water budget caused by pumpage of the aquifer. This type of model was used by Woodbury and Kennedy (2006) to model the effects of drought on the carbonate and sandstone aquifers that lie below the Sandilands Glaciofluvial Complex. Such a model was also used to simulate the changes an expanded Floodway would have on the surficial and carbonate aquifers around Winnipeg.

5.3 Safe yield

If the amount pumped is greater than the recharge, the storage and discharge will continue to decrease until the aquifer is pumped dry. Engineering practice uses the calculation of "safe yield" to insure against such an over-exploitation of an aquifer. Safe yield has traditionally been defined as the amount of water that can be pumped from an aquifer without depleting the storage. It is generally calculated from an analysis of the recharge. However, safe yield is a misleading concept because it does not take into account the changes in discharge or recharge that also occur from pumping, and the impact that these changes have on the other water resources within a watershed. Sustainable yield, an evolution of the safe yield concept viewed in the light of sustainable development, is now reaching widespread acceptance as a more appropriate measure of the amount of groundwater that can be safely withdrawn from an aquifer. Sustainable yield is defined as the amount of water that can be withdrawn from an aquifer without causing a detrimental decrease in storage and damage to surrounding ecosystems and communities. Among the concepts discussed so far, sustainable yield is perhaps the most difficult concept to assess. It is best approached through the application of an integrated watershed model, which can simulate the changes in all resource elements. However, safe yield, when used as a baseline, provides a starting point for the calculation of sustainable yield, since safe yield is less than recharge and sustainable yield is less than safe yield.

To summarize, from the Commission perspective, integrated watershed plans that make use of computational models provide the most satisfactory measure of aquifer sustainability. If a computational model cannot be employed then the predevelopment water budget and the sustainable yield should be provided so that plans to manage the development of the aquifer can be considered.

5.4 Assessing the Project's Sustainability

The historical data needed to establish the predevelopment water budget for the aquifer in question, the Lower Sand Unit, do not exist. The PVWC argued in the hearing that because the aquifer will respond differently after development, the predevelopment water budget is unnecessary and that pumping could proceed as long as a groundwater monitoring network was established that could monitor the changes in storage in the aquifer. If the changes were deemed to have negative impacts on the downstream communities, the pumping would be stopped. What was neglected in the argument was the time it takes for an aquifer to respond to pumping. The time frame for the adjustment of the aquifer to pumping is expected to take decades. Therefore, it would also take decades for the cumulative impacts of pumping to be ascertained by a monitoring network, and if anything were wrong, decades more would be needed before the results of corrective actions would take effect, if the damage could be repaired at all.

The only substantial evidence relating to these issues that the PVWC presented was the estimate of the annual recharge rate. However, its calculations are open to criticism and the annual recharge to the lower sand aquifer could be much less than the PVWC estimate for a number of reasons. First, the calculations discounted the amount of recharge lost to interception, surface runoff, through-flow and amounts intercepted by the

upper sand aquifer. Second, the recharge area used in its calculations straddles the divide of five drainage basins and the calculated recharge does not account for this division. Third, in support of its calculations, the PVWC relied upon data reported by Cherry's study (2000) of this aquifer complex. However, Cherry reports that there is great variation in the recharge rates for this area, as much as a fourfold difference between the maximum and minimum rates. The PVWC used close to the maximum value of recharge reported by Cherry, focusing therefore on the best-case scenario for pumping and ignoring the more likely reality that the recharge rates are lower—possibly as much as four-times lower. All of these reasons suggest that the recharge could be much less than the estimate calculated by the PVWC.

In summary, the rate of recharge to this aquifer is not well understood. The rate of discharge and the discharge pathways are unknown. The historical changes in storage are also unknown. And the safe yield was not calculated. The role of the Lower Sand Unit aquifer within the region's hydrogeological complex and surficial hydrology is not well understood. This is significant in light of the region's hydrogeological and hydrological complexity: it contains at least four aquifers and the headwaters of five rivers. The hydraulic gradients for the wells at the foot of the Bedford Ridge, embedded in the upper sand aquifer, the lower sand aquifer and the bedrock aquifer in the Winnipeg formation, suggest that the lower sand aquifer is a source of water supply to the other two aquifers in the complex, and also likely to the wetlands at the foot of the Bedford Ridge. These wetlands lie in the headwaters of the Seine and Rat River watersheds and their role in the hydrology of these basins is not understood. Without this information it is also not possible to fully assess, not only the Project's environmental impacts, but its socio-economic impacts as well.

5.5 Cumulative effects assessment

Cumulative effects were not specifically addressed at this hearing, however in light of the possible influences of the Project on the surrounding water bodies and landscape described in the previous paragraph, cumulative effects should be considered in future assessments of this and any other development. The ecosystems in the area are currently affected by other developments and activities in the region and consideration of the additive effect of another impact needs to be addressed.

6. Conclusion

The aquifers of the Sandilands Glaciofluvial Complex are an important resource for Manitoba. In the future years, they may be developed, and the water may well be transported to other regions in the province. The Commission notes that under Manitoba water policy, groundwater does not belong to the rural municipality that sits over the aquifer. It also recognizes that off-aquifer shipments of water take place elsewhere in Manitoba. However, such decisions ought to be taken with the sort of knowledge, study and consultation that is required in assembling an integrated watershed plan for the Red River Basin. Development must be undertaken in a way that does not jeopardize either the sustainability of the aquifer or the role that the aquifer plays in relation to the eco-system in which it is situated. To approve this Project prior to the development of an integrated-understanding of how the aquifer fits with its surroundings is not in line with sustainable development guidelines. Furthermore, it would establish a right to the aquifer's water under *The Water Rights Act* and also set a precedent for further development of the aquifer, prior to the appropriate study and consultation having taken place.

The Commission wishes to stress that the responsibility for water management rests with the Government of Manitoba. There are established water policies, and it is the province's responsibility to implement those policies for the good of all Manitobans. The PVWC participated in this hearing process in good faith and provided the sorts of information that were requested of it by the Manitoba government. In the absence of a watershed plan, the PVWC was acting responsibly in the interests of its members.

In conclusion, the Commission is making the following findings and recommendations in relation to this project.

6.1 Findings

- The Pembina Valley Water Cooperative has played and continues to play an important and positive role in developing and conserving water resources in Manitoba. The cooperative model has proven to be particularly effective in assuring responsible resource stewardship.
- The Project cannot be appropriately assessed in the absence of an integrated watershed plan for the Manitoba portion of the Red River basin including associated aquifer plan(s) for the Sandilands aquifers.
- There is also a need for a basin-wide watershed management plan for the Red River. The development and implementation of such a plan will require the cooperation of the Manitoba government, the Government of Canada, and the appropriate state and federal jurisdictions in the United States.
- Without an appropriate calculation of the

sustainability of the aquifer it is not possible to make a reasonable determination of potential impacts of the Project on current and future users of the aquifer in the Sandilands region, the impact of development on the economic growth prospects of the region, and the potential impacts of the Project on regional eco-systems.

- The Manitoba government should play a greater role in facilitating more in-depth investigation into water-supply alternatives, including desalinization and surface water capture in the PVWC region.
- In the area of water management, the Government of Manitoba has a well-developed legislative and policy regime. There is a need for the Manitoba government to fully implement its existing policies and regulations in relation to water management. There is also a need for a further review of its policies and regulations in relation to water extraction and allocation

6.2 Recommendations

The Commission recommends that:

1. In the absence of an integrated watershed and aquifer plan for the Manitoba portion of Red River basin, that an Environment Act license not be issued for the Project.
2. Integrated watershed and aquifer plans include aquifer water budgets and sustainable yield estimates.
3. The Manitoba government take the lead and make development of an integrated watershed plan for the Manitoba portion of the Red River basin and the associated aquifers a priority.
4. The Manitoba government and the Government of Canada work with the appropriate jurisdictions in the United States to develop a fully integrated watershed management plan for the Red River Basin.
5. Both the federal and provincial governments enhance efforts to ensure the negotiation of a guaranteed-flow agreement for the Red River.
6. The Manitoba government further review its policies and regulations regarding water extraction and allocation in respect of watershed management and planning.
7. The Manitoba government enhance efforts to implement its existing policies and regulations in relation to water management.
8. The Manitoba government establish and require higher standards of performance in environmental assessment. To that end, the government should provide comprehensive and clear guidance for proponents, consultants and practitioners by:
    - Issuing Guidelines for projects seeking a licence under The Environment Act that are more prescriptive as to what constitutes an acceptable environmental assessment; and
    - Establishing protocols for best professional practice.

Appendix A
Presenters to the Hearing

Ballance, Kimberly: Manitoba Eco-Network
Barron, Gerry: Public Utilities Board
Brooks, David: Manitoba Eco-Network
Clubb, Lindy: Private
Hovorka, Marvin: Rural Municipality of Piney
Kennedy Courcelles, Cheryl: Private
Koroluk, Glen: Manitoba Eco-Network
Maathuis, Harm: Pembina Valley Water Cooperative
Martel, Richard: Town of Altona
Martens, Herm: Rural Municipality of Morris
Moquin, Claude: Rural Municipality of La Broquerie
Petkau, Art: Rural Municipality of Stanley
Reeves, Laura: Private
Scharien, Charles: Rural Municipality of Grey
Schellenberg, Sam: Pembina Valley Water Cooperative
Watson, Patrick: Seine-Rat River Conservation District
Whelan Enns, Gaile: Private
Whitehead, Bill: Rural Municipality of Roland
Wiecek, Steve: Pembina Valley Water Cooperative
Zacharius, Bill: City of Winkler

Written Submissions

Render, Frank: Private
Whelan Enns, Gaile: Manitoba Wildlands

Appendix B
Principles and Guidelines of Sustainable Development

Principles:

1 Integration of Environmental and Economic Decisions

1(1) Economic decisions should adequately reflect environmental, human health and social effects.

1(2) Environmental and health initiatives should adequately take into account economic, human health and social consequences.

2 Stewardship

2(1) The economy, the environment, human health and social well-being should be managed for the equal benefit of present and future generations.

2(2) Manitobans are caretakers of the economy, the environment, human health and social well-being for the benefit of present and future generations.

2(3) Today's decisions are to be balanced with tomorrow's effects.

3 Shared Responsibility and Understanding

3(1) Manitobans should acknowledge responsibility for sustaining the economy, the environment, human health and social well-being, with each being accountable for decisions and actions in a spirit of partnership and open cooperation.

3(2) Manitobans share a common economic, physical and social environment.

3(3) Manitobans should understand and respect differing economic and social views, values, traditions and aspirations.

3(4) Manitobans should consider the aspirations, needs and views of the people of the various geographical regions and ethnic groups in Manitoba, including aboriginal peoples, to facilitate equitable management of Manitoba's common resources.

4 Prevention

Manitobans should anticipate, and prevent or mitigate, significant adverse economic, environmental, human health and social effects of decisions and actions, having particular careful regard to decisions whose impacts are not entirely certain but which, on reasonable and well-informed grounds, appear to pose serious threats to the economy, the environment, human health and social well-being.

5 Conservation and Enhancement

Manitobans should

(a) maintain the ecological processes, biological diversity and life-support systems of the environment;

(b) harvest renewable resources on a sustainable yield basis;

(c) make wise and efficient use of renewable and non-renewable resources; and

(d) enhance the long-term productive capability, quality and capacity of natural ecosystems.

6 Rehabilitation and Reclamation

Manitobans should

(a) endeavour to repair damage to or degradation of the environment; and

(b) consider the need for rehabilitation and reclamation in future decisions and actions.

7 Global Responsibility

Manitobans should think globally when acting locally, recognizing that there is economic, ecological and social interdependence among provinces and nations, and working cooperatively, within Canada and internationally, to integrate economic, environmental, human health and social factors in decision-making while developing comprehensive and equitable solutions to problems.

Guidelines:

1 Efficient Use of Resources - which means

(a) encouraging and facilitating development and application of systems for proper resource pricing, demand management and resource allocation together with incentives to encourage efficient use of resources; and

(b) employing full-cost accounting to provide better information for decision makers.

2 Public Participation - which means

(a) establishing forums which encourage and provide opportunity for consultation and meaningful participation in decision making processes by Manitobans;

(b) endeavouring to provide due process, prior notification and appropriate and timely redress for those adversely affected by decisions and actions; and

(c)striving to achieve consensus amongst citizens with regard to decisions affecting them.

3 Access to Information - which means

(a)encouraging and facilitating the improvement and refinement of economic, environmental, human health and social information; and

(b) promoting the opportunity for equal and timely access to information by all Manitobans.

4 Integrated Decision Making and Planning - which means

encouraging and facilitating decision making and planning processes that are efficient, timely, accountable and cross-sectoral and which incorporate an inter-generational perspective of future needs and consequences.

5 Waste Minimization and Substitution - which means

(a) encouraging and promoting the development and use of substitutes for scarce resources where such substitutes are both environmentally sound and economically viable; and

(b) reducing, reusing, recycling and recovering the products of society.

6 Research and Innovation - which means

encouraging and assisting the researching, development, application and sharing of knowledge and technologies which further our economic, environmental, human health and social well-being.

References

Cherry, A. 2000. *A Multi-Tracer Estimation of Groundwater in a Glaciofluvial Aquifer in Southeastern Manitoba*, Ottawa-Carleton Geoscience Centre and University of Ottawa Masters Thesis.

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