

PROPOSED IMPLEMENTATION
PLAN FOR RECOMMENDATIONS
IN THE 1991 COG REPORT ON
EVALUATION OF
GROUNDWATER LEGISLATION

Prepared by:

The Prairie Provinces Water Board
Committee on Groundwater

September 1992
PPWB Report No. 118

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EXECUTIVE SUMMARY

The Committee on Groundwater submitted a report entitled "An Evaluation of Existing Groundwater Legislation in the Prairie Provinces" to the Prairie Provinces Water Board in 1991. The Board, in accepting the report, directed the Committee to develop a plan to carry-out the report's five recommendations for immediate implementation.

This report discusses how each of the recommendations should be implemented and, where applicable, a cost estimate is provided. In summary, only two of the five recommendations will require PPWB funding.

Recommendation 1: preparation of groundwater pollution vulnerability maps. Estimated cost \$48,000, of which \$12,000 is already budgeted for this fiscal year. This recommendation is considered the highest priority.

Recommendation 3: development of preliminary aquifer management plans, should be approached by undertaking a two year pilot study beginning in 1993-94. The pilot study will cost an estimated \$35,000.

Recommendation 2 and 4: development of comprehensive and compatible data bases and establishment of a data base in the PPWB offices. These activities would be carried out by the COG as time permits. No PPWB funding is required.

Recommendation 5: development of guidelines to cover potential issues not currently and/or adequately dealt with under existing regulations. These guidelines should be undertaken by the Federal/Provincial Groundwater Working Group. No PPWB funding is required.

INTRODUCTION

The Prairie Provinces Water Board, at its March 1991 meeting, approved the Committee on Groundwater (COG) report entitled "An Evaluation of Existing Groundwater Legislation in the Prairie Provinces" and agreed that the COG should "... prepare implementation strategies for the report recommendations of immediate implementation identified in the executive summary of the report ..." (Board minute 46-106).

The five recommendations for immediate implementation are:

1. The PPWB should coordinate the preparation and publication of a series of groundwater pollution hazard maps (constraint maps) at each interprovincial boundary to identify sensitive areas such as shallow aquifers and recharge areas.
2. The PPWB facilitate the development of a comprehensive and compatible groundwater data base for the prairies, to meet practical management needs.
3. Allocation of groundwater in interprovincial aquifers should be based on aquifer management plans which ensures cumulative interprovincial and multi-user withdrawals are consistent with sustainable safe yield.
4. A computer data base should be assembled and maintained in the PPWB's office to monitor groundwater allocations in each of the interprovincial aquifers identified.
5. The PPWB should promote the development of comprehensive guidelines to respond to groundwater issues currently not specifically covered by legislation in the prairie provinces.

The Committee on Groundwater has reviewed these recommendations and accordingly, has developed an implementation strategy for each recommendation. Consideration was made for related, ongoing activities of member agencies that could not only impact on the approach itself, but also affect the implementation timetable. As well, being cognizant of budget restraints, the Committee has scheduled the work over several years to minimize budget and time commitments of COG members.

The following sections outline the proposed implementation strategy for each of the five recommendations outlined above. Each section contains a short background describing the concerns to which the specific recommendation is responding to, along with the objectives, activities, anticipated time schedule and costs required to implement each recommendation.

1. Publication of Groundwater Pollution Maps at Each Interprovincial Boundary

(a) Background:

Groundwater is an essential resource for the people and economy of the prairies, with approximately 90% of the rural population relying on groundwater as their primary source of water. The protection of this resource is therefore essential to the well being of the region.

Throughout North America and Europe there has been an increasing problem with aquifer contamination, resulting in a significant loss of groundwater as a water source. Efforts to reclaim contaminated aquifers often require very expensive remedial programs that are frequently not successful in spite of the money spent. Contamination prevention through aquifer protection is therefore held to be the best solution.

An essential pre-requisite to contamination prevention is groundwater protection mapping. The concept is based on the premise that aquifer sensitivity to potential contamination can be estimated by mapping selected hydrogeologic and/or soil parameters such as land cover characteristics associated with various aquifer units identified from existing test hole data. The end product would be a series of coloured maps showing zones or areas of groundwater pollution potential ranked from low to high vulnerability. The maps can then be used to help define protective land-use plans for large geographic regions.

Because of the generalized data and scale of the maps, site specific subsurface studies would still be required for locating projects or undertaking activities that could pose a potential groundwater contamination risk.

(b) Objective:

The objective of this project is to produce and publish a series of maps at the interprovincial boundaries which would determine aquifer vulnerability to potential groundwater contamination from surface activities.

These maps would identify and draw attention to geographically based zones of groundwater sensitivity irrespective of provincial boundaries, but would not eliminate the need for site specific environmental assessments.

(c) Methodology:

The area to be mapped is approximately 30 km on each side of the Alberta-Saskatchewan and Saskatchewan-Manitoba borders to correspond with the

PPWB hydrogeologic profile maps prepared in 1986. The mapping would extend from the U.S. border to 55° along the Saskatchewan-Alberta border and 53° along the Saskatchewan-Manitoba border. Each map would be on a scale of 1:250,000. A total of 10 maps would be prepared for the Saskatchewan-Alberta and for the Saskatchewan-Manitoba boundaries.

The Aquifer Vulnerability Index (AVI) Method as described in the PPWB Groundwater Protection Map Pilot Study report would be used to generate the maps using the following steps:

1. Each province will, in consultation with NHRI, identify the data needed for generating the groundwater protection maps,
2. Each province will provide digitized data to the NHRI,
3. The NHRI will generate the groundwater protection map,
4. PPWB Secretariat will prepare camera-ready sheets needed for printing of colour maps,
5. PPWB Secretariat will publish and distribute report and map sheets to member agencies for information.

The AVI method for mapping groundwater vulnerability is based mainly on water well drillers' logs. These records comprise the most extensive data set available to determine the hydrostratigraphy of the shallow subsurface of the prairies and provide the information that the AVI system requires.

While the proposed mapping project does have limitations, it would be very difficult and costly to develop a map which includes all potential issues. Most notably, the proposed approach is only suitable for identifying sensitivity of surficial or shallow aquifers and may not adequately identify potential problems in confined or deep aquifer systems. Because of these limitations the Committee views the mapping project as only a starting point of activities which could be undertaken to protect interprovincial aquifers.

(d) Time Schedule and Estimated Costs:

- 1992-93 - Finalize the approach for mapping the transboundary areas.
 - Identify the data requirements for this mapping project.
 - Digitize the well-log data.
 - Initiate work on computer versions of constraint maps for two map sheets along each of the interprovincial boundaries (a total of four maps). The estimated cost to initiate this mapping is

- \$12,000 which is included in the 1992/93 PPWB budget.
- to ensure this schedule is maintained the COG has already initiated some work including providing digitized well-log records to the NHRI.
- 1993-94 - Complete the four map sheets initiated in 1992-93 (\$8,000).
- Produce computer version of constraint maps for the remaining area, a total of six maps (estimated cost: \$20,000).
- 1994-95 - Colour separation, printing and distribution of report and map sheets to member agencies. (estimated cost: \$8,000).
- Total Cost: \$48,000. Note: The estimated costs to do this work are considered conservative. Cost to do mapping in 1993-94 may be less than estimated as procedures become refined with experience gained in 1992/93.

2. Groundwater Database for the Prairie Provinces

(a) Background:

The development and support of effective, long-term groundwater management policy requires high quality, relevant management data. Currently, each provincial government maintains a separate groundwater data base designed to meet its own specific needs; unfortunately, in addition to a lack of standardization, there are no common protocols by which the basic technical data contained within these bases are regulated. This situation has caused considerable problems in previous initiatives in two key areas, these being i) the exchange and ii) the analysis of interprovincial groundwater data, and is seen as a major impediment to future interjurisdictional co-operation and planning, particularly with respect to issues of multi-user resource development at critical boundary areas.

In recognition of the problems associated with the exchange of incompatibly formatted data, National Groundwater Guidelines for data exchange have been developed by Environment Canada, in cooperation with all of the Provinces. However, because of the generality of the National Guidelines there remains a need for the Committee to work towards organizing regional/interprovincial data into an analytical framework which meets the management objectives of the three prairie provinces.

In order to address these concerns, the Committee proposes that: i) all provincial data bases should be comparable in format and content to facilitate data exchange, and; ii) all provincial data bases should contain essential

management related information based on mutually acceptable protocols, including the adoption of standard aquifer definition and evaluation parameters.

In consideration of item i), the Committee has agreed to participate in a Federally funded project for the development of interjurisdictional data exchange software. The software will be designed to retrieve groundwater data from an existing data base, translate the data into a standardized form and subsequently enter these data into any other Federal or Provincial data base; this task is expected to get underway in the near future.

With respect to item ii), the Committee has agreed, in principle, to two action items; first, the Committee has agreed to consider the practical experience gained in the PFRA Special Areas ESI (Environmental Sustainability Initiative) Deep Groundwater Project in terms of developing and refining groundwater management methodologies and protocols in a project involving a major interprovincial groundwater system, and secondly, the Committee has agreed to establish a task force to review data base requirements and to make recommendations to the Committee regarding the use of the data to address groundwater management issues.

(b) Objective:

The objective of this activity is to promote and facilitate the development of a comprehensive and consistent groundwater data base for the prairie provinces. The data base would be used to develop and implement practical and sustainable groundwater management strategies along the provincial boundaries.

(c) Methodology:

i) Development of Data Exchange Software

1. The provincial COG members have indicated they will assist the contractor carry out his/her activities by providing required information.
2. The results of the project will be evaluated by the COG.
3. Timing of this project is dependent on when Environment Canada initiates the project.

ii) PFRA Special Areas Project

1. PFRA will continue to advise the COG of progress of the study.
2. The COG will review the draft report by PFRA in 1993 and prepare an assessment of the study results as it affects the Committee's interest in interprovincial aquifers.

iii) Data Base Review

A Task Force reporting to the Committee would be established to conduct a detailed review and evaluation of existing groundwater data bases in each of the member agencies to determine:

1. The completeness and reliability of existing groundwater data in the prairie provinces,
2. What each agency can do to improve their data base to a level identified as being an "ideal" data base,
3. What should be the minimum parameters contained in each provincial data base to ensure the compatible management of interprovincial aquifers,
4. The level of reliability of these parameters,
5. The need for and ways to achieve a common data base format (ie. GIS), as well as the development of standards to integrate and illustrate combined parameters and/or attributes, particularly for the preparation of interprovincial maps and reports,
6. Procedural requirements within each province in order to establish a common groundwater data base for the prairie provinces.

(d) Time Schedule and Estimated Costs:

1992-93 - Committee review of data management issues in the PFRA Special Areas ESI Deep Groundwater Project.

1993-95 - Establishment of a Task Force under the Committee to recommend a comprehensive and a compatible groundwater data base for the prairie provinces.

- No direct costs to the PPWB have been identified for this activity.

3. Aquifer Management Plans

(a) Background:

Because different criteria and procedures are used by each province in the allocation and protection of groundwater, the potential exists for conflicts or mismanagement of an aquifer shared by two jurisdictions. It is therefore in the mutual interest of each jurisdiction to work together to protect the aquifer from over development (allocation) and pollution.

Under current practices most groundwater is usually allocated on the concept of single point withdrawal with no consideration for the accumulated impact on the aquifer. In the case of interprovincial aquifers this problem is compounded and there is nothing legally restricting either province from overallocating the shared interprovincial aquifer. Ribstone Creek (PFRA Special Area Project) and Cold Lake are two examples of studies or development scenarios involving interprovincial aquifers whose development in one jurisdiction could adversely impact residents and/or economics of a neighbouring jurisdiction.

With respect to groundwater protection, individual provinces have their own criteria for protecting aquifers. Because of this variability, interprovincial aquifers could be put at risk unless there is an agreement on how those aquifers should be protected.

Development of aquifer management plans for interprovincial aquifers is an important step in achieving the goal of equitable allocation and protection of groundwater while ensuring that the development in each province is in line with the concept of resource sustainability.

Three groundwater management plans have recently been developed in Saskatchewan and Alberta has developed an aquifer plan for Cold Lake. These plans provide examples of pertinent information needed for managing an aquifer.

An important difference between the existing provincial plans and the proposed project is that the existing plans used test drilling and observation wells to fill in information gaps and establish an accurate monitoring of the aquifer. This level of information was required to address the specific issues associated with these aquifers.

Such a level of detail is not required for the PPWB project. This project would utilize existing information to the fullest extent possible. The main products would be the prioritization of essential data and identification of data gaps to help improve aquifer management, along with the establishment of formal management unit boundaries. In general, what is being proposed is the development of a framework to provide a common, practical basis for the management of principle aquifers which are interprovincial in nature to ensure sustainability of the resource. The work concerning Recommendation 2 is expected to provide support for the completion of any subsequent aquifer management plans.

(b) Objective:

The objective is to develop preliminary aquifer management plans for selected interprovincial aquifers.

(c) Methodology:

Twelve interprovincial aquifers have been identified as requiring aquifer management plans. Seven of these aquifers cross the Alberta/Saskatchewan boundary and five cross the Saskatchewan/Manitoba boundary.

A two year pilot study of the Welby aquifer is proposed for 1993-94 to initiate this project. This surficial aquifer of high quality water, which crosses the Saskatchewan/Manitoba border, will be used to prove up techniques and cost estimates for developing future interprovincial aquifer management plans. The Hatfield aquifer in the Cold Lake area would be the next priority for an aquifer management plan.

The aquifer management plan would include or indicate the deficiency in such information as:

1. identification of the extent of the aquifer management unit and its characteristics,
2. identification of data needs for aquifer management,
3. determination of sustainable yield,
4. evaluation of existing withdrawals, potential for development, and consequences of water development decisions (e.g. drainage of wetlands),

5. identification of critical areas needed to protect the aquifer from contamination and ensure optimum recharge.

A consultant, working closely with COG members, would be required to undertake the drafting of the management plans. However, to help minimize PPWB study costs other stakeholders that would benefit from having an aquifer management plan should be approached to seek financial assistance.

(d) Time Schedule and Estimated Cost:

The pilot study should be initiated in 1993/94 and be spread over two years. The estimated cost to do this pilot project is \$15,000 in 1993/94 and \$20,000 in 1994/95.

It is proposed that the aquifer management plan for the Hatfield be started in 1994/95 and also be done over two years. Starting in 1995/96, two plans per year should be undertaken.

Total cost to prepare aquifer management plans for all 12 aquifers is estimated to be \$420,000. This estimate may be revised after completion of the pilot project.

4. Groundwater Allocation and Protection Data Base

(a) Background:

Allocation and protection information about projects that affect aquifers are maintained in the water rights office of each province. Consequently, a complete picture of what is happening to an interprovincial aquifer is not currently available. Therefore, there is a need to establish a central data bank which could provide data to resource managers on the entire aquifer.

In response to this need, it is proposed to establish a data base in the PPWB office to keep track of groundwater allocations, and activities related to aquifer protection such as waste disposal and landfill sites in each interprovincial aquifer. The information contained in this data base would assist in the development of aquifer management plans, and facilitate project evaluation.

The Board has used a similar approach for several years to deal with surface water allocation for Boxelder Creek basin and artificial drainage projects for interprovincial streams.

(b) Objective:

The objective of this activity is to establish and maintain a data base of information related to groundwater allocation and protection of important interprovincial aquifers.

(c) Methodology:

1. Some of the parameters to be documented in the data base would include:
 - aquifer name,
 - project land location,
 - applicant name,
 - file no.,
 - authorization date,
 - license date,
 - annual allocation,
 - purpose of project,
 - NTS map number,
 - production interval (eg., 11 m to 14 m).
2. Each year the provincial COG members would provide the Secretariat with revised groundwater allocation and protection information including any addition or cancellation of projects in each interprovincial aquifer.
3. The Secretariat would be responsible for entering information into the data base.
4. Each year the Secretariat would prepare a brief report to the COG summarizing project information for each interprovincial aquifer.
5. The summary report of project information would be reviewed each year by the COG to determine any potential problems.

(d) Time Schedule and Estimated Cost:

It is recommended that the data base be created in 1993-94. Because data would be provided by the provinces and entered into the data base by the PPWB Secretariat staff there is no direct cost to the PPWB.

5. Groundwater Guidelines

(a) Background:

The Committee on Groundwater, in reviewing the existing groundwater legislation, identified five groundwater issues (i.e., chemigation, structure foundation boreholes and excavations, seismic boreholes, groundwater recharge area protection, and control of fluid circulation related to heat pumps) which are not adequately regulated by legislation in the prairie provinces. To date, only very local problems have occurred with any of these issues. However, some of them could cause significant future problems if left unregulated.

The COG recommends that it would be appropriate for all of these issues which require guidelines to be handled by the Federal/Provincial Working Group on Groundwater. This Working Group, which is chaired by Environment Canada with representation from each province, provides an existing mechanism to respond to the issues at a national level. The Working Group has, as noted earlier, developed National Groundwater Guidelines to facilitate data compatibility. More recently, the group established a sub-committee to draft guidelines for ground source heat pumps - one of the issues identified by the COG as requiring guidelines.

There is no cost to the PPWB for requesting the Federal/Provincial Working Group to take the lead in developing guidelines for the five issues identified.

