STRATEGIES
FOR APPORTIONMENT
MONITORING OF SMALL
INTERPROVINCIAL STREAMS

After completion of natural flow studies on the five large interprovincial streams, the Board in 1976 directed the COH to undertake natural flow studies on selected small eastward flowing interprovincial streams to determine if monitoring of apportionment is required for these streams. A total of 20 streams have been studied to date. As well there has been natural flow studies carried out on Lodge, Middle and Battle Creeks where apportionment is now formally implemented. When natural flow studies were completed, the Board, at its October, 1987 meeting, instructed the COH to develop a strategy paper on apportionment monitoring for small interprovincial streams. They also instructed that the contents of this paper should include:

1) A categorization of streams for potential apportionment problems (i.e. long, medium and short term);

2) A cost-effective strategy for improving the existing data base (i.e. relocation of existing stations, monitoring of water use);

3) A procedure for keeping the committee informed of potential apportionment problems and for notifying the Board when monitoring is required.

Unfortunately, the hydrometric network for small interprovincial streams was established for hydrology rather than apportionment monitoring purposes.

Fortunately, hydrometric stations existed on most small interprovincial streams to facilitate natural flow studies. These studies provided an indicator of the number of years there would have been a deficit in deliveries on each small interprovincial stream under present levels of consumptive use.

CATEGORIZATION OF STREAMS FOR POTENTIAL APPORTIONMENT PROBLEMS

The categorization of streams for potential apportionment problems has been prepared from input provided by the provinces. Criteria used by the provinces to determine the apportionment potential included the following:

- the number of times an apportionment deficit has or would have occurred in the past.

- the present level of use and forecasted future demands in both upstream and downstream provinces.

- the existence of storage projects in the upstream province.

- the perception of basin residents towards the reality of an apportionment problem.

Therefore, the categorization of streams as to high, medium or low potential for apportionment problems is subject to change on a periodic basis.

Table 1 provides a summary of relevant information for each of the twenty small interprovincial streams, where studies have been conducted for the Board. A brief analysis follows for each stream. At the end of this report, a map is provided indicating the locality of each stream and its potential need for apportionment monitoring.

A High Potential

A1 Boxelder Creek

- Complex basin consisting of streams arising in both Alberta and Saskatchewan.

- In 43 years of the 77-year period 1912 to 1988, there would not have been enough water to meet licensed uses in both provinces.

- Because this basin is over allocated, it is being treated as a special interprovincial basin with joint water management by Alberta and Saskatchewan.

- The Board has agreed with the COH recommendation contained in its 1984 report Boxelder Creek Basin - Apportionment Study, that no further development should be considered unless cancellation of existing water rights brings the total water allocated in the basin to less than 75% of the median annual natural flow.

- If apportionment monitoring is implemented, a hydrometric network consisting of the following station is required:

Boxelder Creek at Hargraves Ranch	(existing)

A2 <u>Pipestone Creek</u>

- Saskatchewan present level (1989) of consumptive use would have exceeded 50% of the natural flow during only 2 years in the 77-year period 1912-13 to 1988-89.

- Apportionment requirements are essentially governed by Manitoba's need for equitable apportionment (e.g. fall deliveries) to replenish the domestic water supplies.

- The largest deficit in deliveries would have been 1104 dam^3 in 1961-62.

- If apportionment monitoring is implemented, the hydrometric network consisting of the following stations is required:

Pipestone Creek above Moosomin Reservoir	(existing)
Pipestone Creek near Moosomin	(existing)
Pipestone Creek near the Saskatchewan Boundary	(existing)

B Medium Potential

B1 Antler River

- Saskatchewan present level (1987) of consumptive use would have resulted in a deficit in deliveries during eleven years in the 75-year period 1912-13 to 1986-87.

- Largest deficit in deliveries would have been 816 dam^3 in 1967-68.

- If apportionment monitoring is implemented, the following hydrometric stations required are:

Antler River near Melita	(existing)
Auburnton Creek Reservoir	(proposed)
Carnduff Reservoir	(proposed)

It should be noted that only monthly observations are required for the proposed stations, which can be attained with a manual gauge.

B2 Beaver River

- No deficits in deliveries would have occurred.

- The existing (1992) concern for apportionment of this stream is related to low lake water levels and low streamflow in this area of both Alberta and Saskatchewan.

- If apportionment monitoring is implemented, the following hydrometric station is required:

Beaver River at Cold Lake Reserve	(existing)

B3 Gainsborough Creek

- Spillway releases from the Gainsborough Community Project could have eliminated approximately one-half of the deficits, which at the present level of use, would have occurred during 22 years in the 76-year period 1912-13 to 1987-88.

- Largest deficit in deliveries would have been 488 dam^3 in 1936-37.

- If apportionment monitoring is implemented, the hydrometric network requirements are:

Gainsborough Creek near Lyleton	(existing)
Gainsborough Reservoir near the Saskatchewan-Manitoba Boundary	(proposed)

B4 Graham Creek

- Saskatchewan present level (1988) of use would have exceeded 50% of the natural flow during only 3 years in the 76-year period 1912-13 to 1987-88. There is a medium potential apportionment concern by Manitoba due to the perceived concern over future agricultural water supplies in this chronic drought-prone region of Manitoba.

  - Largest deficit of 13 dam^3 would have occurred in 1985-86.

  - If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

    Graham Creek near the Saskatchewan-Manitoba Boundary (proposed)

B5 Jackson Creek

  - Saskatchewan present level (1988) of use would have exceeded 50% of the natural flow during 30 years in the 76-year period 1912-13 to 1987-88. However, there is only medium potential apportionment concern at this time since there is not a major requirement in Manitoba for their share of water in this stream.

- Largest deficit in deliveries would have been 52 dam^3 in 1952-53.

- If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

  Jackson Creek near the Saskatchewan-Manitoba Boundary (proposed)

B6 Stony Creek

- Saskatchewan present level (1988) of use would have exceeded 50% of the natural flow during 25 years in the 76-year period 1912-13 to 1987-88. At this time there is only a medium potential apportionment concern as there is not a major requirement in Manitoba for their share of water in this stream.

- Largest deficit in deliveries would have been 26 dam^3 in 1953-54.

- If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

  Stony Creek near the Saskatchewan-Manitoba Boundary (proposed)

- Additionally, monitoring of water projects is inadequate, and if apportionment monitoring is implemented, the following steps should be taken:

- maintain annual records of water use at the Flynn Project (proposed)

- maintain annual records of drainage from the Dixon Project (proposed)

C Low Potential

C1 Assiniboine River

- At the present level of use, no deficits in deliveries would have occurred during the period 1912-13 to 1987-88.

- If apportionment monitoring is implemented, the hydrometric network consisting of the following six stations is required:

  Assiniboine River at Kamsack (existing)
  Assiniboine River near Russell (existing)

Lake of the Prairies near Shellmouth	(existing)
Shell River near Inglis	(existing)
Theodore Reservoir near Theodore	(existing)
Willow Brook at Willowbrook	(existing)

C2 Battle River

- At the present level of use, no deficits in deliveries would have occurred during the period 1912 to 1988.

- If apportionment monitoring is implemented, the hydrometric network consisting of the following six stations is required:

Alberta Power Reservoir	(existing)
Battle River at the Saskatchewan Boundary	(existing)
Battle River near Ponoka	(existing)
Battle River near Forestburg	(existing)
Bigstone Creek below Pipestone Creek	(existing)
Coal Lake Reservoir near Wetaskiwin	(existing)

C3 Big Gully Creek

- No deficits in deliveries would have occurred. During the driest year (1982), the present level of consumptive use would have been 33% of natural flow at the boundary.

- If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

  Big Gully Creek near the Alberta-Saskatchewan Boundary (proposed)

C4 Birch River

- At the present level of use, no deficits in deliveries would have occurred during the period 1936-37 to 1984-85.

- If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

  Birch River near the Manitoba Boundary
  (proposed)

C5 Bosshill Creek

- Present level (1988) water use in Saskatchewan is zero.

- If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

  Bosshill Creek near the Saskatchewan-Manitoba Boundary (proposed)

C6 Elm Creek

- Present level (1987) water use in Saskatchewan is zero.

- If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

Elm Creek near the Saskatchewan-Manitoba Boundary (proposed)

C7 Eyehill Creek

- A deficit in deliveries would have occurred in only one year during the 77-year period 1912-88.

- The deficit in delivery of 21 dam^3 would have occurred in 1988.

- If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

Eyehill Creek near the Alberta-Saskatchewan Boundary (proposed)

C8 Gopher Creek

- Present level (1988) Saskatchewan average annual use is 6 dam^3, and a deficit in deliveries may have occurred in only one year during the 76-year period 1912-13 to 1987-88.

- A deficit in deliveries of 1.5 dam^3 may have occurred in 1981-82.

- If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

Gopher Creek near the Saskatchewan-Manitoba Boundary (proposed)

C9 Overflowing River

- Present level (1986) Saskatchewan average annual use is 3 percent of the natural flow, and no deficit in deliveries would have occurred.

- If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

Overflowing River near the Saskatchewan-Manitoba Boundary (proposed)

C10 Red Deer River (Saskatchewan)

- Saskatchewan present level (1986) of use is negative by approximately 45,400 dam^3 as drainage projects have increased the average annual flow.

- If apportionment monitoring is implemented, the hydrometric network consisting of the following station should be adequate:

Red Deer River near Erwood (existing)

C11 Swan River

- During the driest year (1961-62), the present level (1983) of consumptive use would have been 0.06% of the natural flow.

- If apportionment monitoring is implemented, the streamflow network is inadequate and the following station is required:

Swan River near the Saskatchewan-Manitoba Boundary (proposed)

C12 Woody River

- Saskatchewan present level (1988) consumptive use in the basin is zero.

- If apportionment monitoring is implemented, the hydrometric network is inadequate and the following station is required:

Woody River near the Saskatchewan-Manitoba Boundary (proposed)

COST-EFFECTIVE CONSIDERATIONS FOR IMPROVING THE EXISTING DATA BASE

Canada has a continuing responsibility to make sufficient streamflow measurements to ensure that the terms of the Prairie Provinces Water Board Master Agreement on Apportionment are met. This responsibility is described in Section 7 of the Master Agreement as follows:

> "... The parties agree that the monitoring of the quantity and quality of waters as specified in the First and Second Agreements, the collection, compilation and publication of water quantity and quality data required for the implementation and maintenance of the provisions of this agreement shall be conducted by Canada, subject to provision of funds being voted by the Parliament of Canada."

To ascertain if apportionment monitoring is required, the establishment and maintenance of one or more hydrometric stations on each of the interprovincial streams is required for the computation of natural flows for apportionment. Although hydrometric stations on some streams have not been ideally situated, or even established, for apportionment monitoring, the network has generally been adequate for conducting natural flow studies.

Fortunately, existing hydrometric networks are adequate on the two streams which have been identified as high potential for apportionment monitoring. Continued operation of the

hydrometric network in these basins is essential to implement apportionment monitoring when required by the Board.

The occurrence of a deficit in deliveries at present level of water use would have been frequent for many of the streams identified as medium potential for apportionment monitoring. Hydrometric networks in the medium potential apportionment monitoring category should continue to be maintained for possible future apportionment monitoring purposes and, to the extent possible, should serve multi-use purposes. The inadequate apportionment monitoring networks in the Graham, Jackson and Stony Creek basins warrants that an evaluation be undertaken to ascertain if existing hydrometric networks on these streams can be replaced with an enhanced network. As hydrometric networks are continually under evaluation by Hydrometric Agreement Coordinating Committees, these committees would be the appropriate parties to conduct this evaluation.

Twelve of the twenty basins studied have been identified as low potential for apportionment monitoring, and for most of these streams a deficit in deliveries would not have occurred. For purposes of only apportionment monitoring, an obvious cost-effective strategy would be to discontinue the hydrometric stations in these basins. While the majority of the streams, identified as low potential for apportionment monitoring, have inadequate hydrometric networks for this purpose, the networks also serve other purposes which cannot be overlooked. These purposes would include use in aquatic ecosystem management, water management, flow forecasting, regional hydrology, etc.

However, even if these other uses are considered, there are some existing stations which do not appear to satisfy any of these purposes and could be discontinued. To enhance the network for many of the low potential for apportionment monitoring category streams, it would be necessary to undertake an evaluation of each basin to ascertain the adjustments required to obtain a multi-use hydrometric network. Hydrometric Agreement Coordinating Committees should be the parties to conduct these evaluations.

PROCEDURE FOR KEEPING THE COMMITTEE INFORMED OF POTENTIAL APPORTIONMENT PROBLEMS

Various procedures are addressed in detail in Board reports "Administration of the Apportionment Agreement", "Handbook for Administration of the Apportionment Agreement", and "Guidelines for Negotiating Equitable Apportionment". These procedures were designed for the major interprovincial streams that are subject to formal apportionment. However, some of these procedures can be considered for developing a procedure for small interprovincial streams. In particular, the following extracts from Chapter III of "Handbook for Administration of the Apportionment Agreement" help define appropriate procedures for keeping the PPWB informed of potential apportionment problems.

> "Each provincial jurisdiction is responsible for managing water resources in its own province to meet the terms of apportionment. Each province operates projects to manage water with due regard to the requirements of the Agreement. In doing this they have continuing responsibility to determine their own provincial needs and when those needs conflict with water use in adjacent provinces to negotiate equitable sharing of flow subject to apportionment."

> "Each provincial member has a responsibility to keep the Board informed of all prospective developments in that member's jurisdiction to ensure that such developments will not adversely affect the apportionment of inter- provincial water or the integrated development of water resources of interprovincial streams."

These previously formulated Board procedures provide the framework for a simplified strategy for determining the apportionment potential for small interprovincial streams. Annually, each province should review its project development, water licensing, water use, and water management practices for each interprovincial basin in that member's

jurisdiction. This information would be presented at either the spring or fall meeting of the COH, who would then determine if the apportionment potential for a stream should be revised. Implementation of this strategy would enable a province, the COH and ultimately the Board to become aware of potential problems in a qualitative sense.

CONCLUSIONS

1. Of the twelve streams identified as low potential for apportionment monitoring, there is no requirement to maintain a permanent hydrometric network for apportionment monitoring purposes. Operation of a hydrometric network in many of these basins has served the purpose of providing streamflow data to undertake natural flow studies, and ascertain that the requirement for apportionment monitoring currently isn't a problem in these basins.

2. Much of the hydrometric network in the categories of low and medium potential for apportionment monitoring is unsuitable if apportionment monitoring is required.

3. Hydrometric networks in the Boxelder and Pipestone Creek basins, which have been identified as high potential for apportionment monitoring, have existing hydrometric networks which satisfy monitoring requirements.

STRATEGY

1. The COH should annually review any development or proposed development to qualitatively determine if the apportionment monitoring potential of a stream should be revised.
2. If a stream is identified as high potential for apportionment monitoring, a position paper should be prepared by the COH for the Board.

3. The Hydrometric Agreement Coordinating Committees of Saskatchewan and Manitoba should be requested to evaluate the existing hydrometric networks of Graham, Jackson

and Stony Creeks, for purposes of establishing a network more suitable for apportionment monitoring, when it may be required.

4. Existing hydrometric networks, which could be required for apportionment monitoring of basins identified as either high or medium potential should be maintained.