TECHNICAL REPORT TO THE

PPWB COMMITTEE ON HYDROLOGY

NATURAL FLOW

EYEHILL CREEK

AT ALBERTA - SASKATCHEWAN BOUNDARY

JULY 1984

PPWB REPORT #68

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SYNOPSIS

The results of this study confirm that the terms of the 1969 Master Agreement on Apportionment were not violated on an annual basis in the Eyehill Creek Basin at any time during the period 1912-1980. In fact, the net depletion of streamflow in the Alberta portion of the basin did not exceed 18% of the natural flow at the interprovincial boundary in any March-October period.

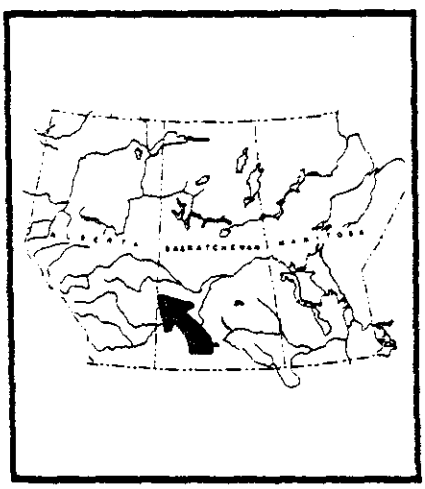
The present (1980) level of water resources development in the Alberta portion of the Eyehill Creek Basin may cause a violation of the 1969 Master Agreement on Apportionment in extremely dry years. With the present level of development, including all licensed, authorized and unauthorized projects, the net depletion of streamflow in the Alberta portion of the basin would have exceeded 50% of the natural flow at the boundary in one March-October period between 1912 and 1980.

At a time when apportionment of flow in Eyehill Creek becomes necessary, serious consideration should be given to constructing a hydrometric station at the Alberta-Saskatchewan boundary, augmenting the available water use data, and reviewing the delineation of the effective drainage basin.

TABLE OF CONTENTS

Contents (cont'd)

LIST OF TABLES: (continued)



INTRODUCTION

Following the completion of the Prairie Provinces Water Board's study on Determination of Natural Flow of the North Saskatchewan, South Saskatchewan, Saskatchewan, Churchill and Qu'Appelle River Basins in 1977, the Board agreed to have other interprovincial basins studied to determine if natural flow computations were required for apportionment at this time. A list of interprovincial basins was prepared and priorities were assigned to the listed basins. The Board agreed that the basins would be studied in order of priority as funds and time became available. In November 1980 Environment Canada signed a Memorandum of Agreement with the Board to undertake the natural flow study of Eyehill Creek. This report, entitled "Natural Flow: Eyehill Creek at Alberta-Saskatchewan Boundary" describes the basin geography, water use within the basin, and the derivation of historic natural flows at the Alberta-Saskatchewan boundary. The present level of use is analysed in conjunction with natural flows to indicate the potential for apportionment deficits. The adequacy of the existing hydrometric and meteorological networks for the determination of natural flow at the interprovincial boundary, is assessed.

BASIN GEOGRAPHY AND HYDROLOGY

The location of Eyehill Creek is shown in Figure 1. Eyehill Creek crosses the Alberta-Saskatchewan boundary approximately midway between the points where the North Saskatchewan River and South Saskatchewan River cross the boundary. The creek originates just east of Sounding Lake in Alberta and flows generally northeastward for approximately 35 kilometres before crossing the interprovincial boundary. It then flows northeastward in Saskatchewan for an additional 55 kilometres before discharging into Manito Lake.

The gross drainage basin (i.e. entire watershed) of Manito Lake is delineated in Figure 1. PFRA (4) considered the Manito Lake Basin to be dead-ended since the lake has no well-defined surface outlet. The gross drainage area of the basin (i.e. size of gross drainage basin) is 14 200 km^2. The gross area drained by Eyehill Creek between Sounding Lake and Manito Lake is 3 400 km^2 or 24% of the entire Manito Lake Basin. The longest stream in the Manito Lake Basin is Sounding Creek, which originates just east of Sullivan Lake and terminates at its outlet to Sounding Lake. Together, Sounding Creek and Sounding Lake drain a gross area of 8 560 km^2 or 60% of the entire Manito Lake Basin. PFRA (4) has suggested, however,

that Sounding Lake would not discharge into Eyehill Creek during floods of return periods less than two years.

A review of aerial photographs taken in 1947, 1970 and 1974, water level records for 1955 to 1980, comments from area residents, and a site reconnaissance in October 1981, confirmed that Sounding Lake has spilled into Eyehill Creek on a very infrequent basis.

The effective drainage basins (i.e. portion of entire watershed which contributes to streamflow) of the two hydrometric stations on Eyehill Creek was delineated in Figure 2. One station (WSC No. 05GA007) is located near the Town of Macklin in Saskatchewan and the other station (WSC No. 05GA001), which has been removed, was located near the mouth of the creek. The effective drainage basin delineations are the same as those proposed by PFRA (4) except for the exclusion of Eyehill Lake and Cosine Lake which, based on a review of aerial photographs, comments from area residents, and a site reconnaissance, are believed to have only an infrequent effect on Eyehill Creek flows. The effective drainage area (i.e. size of effective drainage basin) of Eyehill Creek at WSC Station No. 05GA007 is 190 km^2 and at WSC Station No. 05GA001 is 350 km^2. Also shown on Figure 2 is the effective drainage basin of Eyehill Creek at the interprovincial boundary. The effective area of Eyehill Creek at the interprovincial boundary is 130 km^2 of which all but 2 square kilometres is located in Alberta.

Eyehill Creek is classified as an intermittent stream. Spring snowmelt contributes a large percentage of the annual runoff and causes a peak flow in April or early May of most years. Summer and autumn flows constitute a small part of the annual runoff but do, upon occasion, reach flood magnitudes following intense summer rain storms. During the period

from November to February, Eyehill Creek is usually frozen and streamflow is not recorded. The mean March-October flow at WSC Station No. 05GA007 during the period of operation from 1967 to 1980 was 2 560 dam^3. The mean March-October flow at WSC Station No. 05GA001 during the period from 1921 to 1929 was about 7 960 dam^3. Recorded streamflow data for these two stations are presented in Appendix A.

Two additional stream gauging stations have been operated in the Manito Lake Basin. One station (WSC No. 05GA008) is located on Sounding Creek near the Town of Oyen and has been in operation since 1968. The other station (WSC No. 05GA003) is located on Monitor Creek at the Town of Monitor and has been in operation since 1954. The effective drainage areas at WSC No. 05GA008 and WSC No. 05GA003 are 868 km^2 and 326 km^2 respectively.

Only one meteorological station has been operated in the gross drainage basin of Eyehill Creek between Sounding Lake and Manito Lake. The station was located at the Town of Macklin and was in operation from April 1921 to August 1979, except for a number of months in the September - April season of some years. Monthly precipitation for this station is included in Table B-1 of Appendix B. For periods between 1912 and 1978 when the Macklin station was not operating, precipitation recorded at North Battleford was assumed to be representative of precipitation over the Eyehill Creek Basin. In June 1978 a meteorological station was established at Provost, about 15 kilometres north of the Eyehill Creek Basin. For the period since September 1979, precipitation recorded at Provost was assumed to be representative of precipitation over the Eyehill Creek Basin.

The closest meteorological station to the effective basin of Eyehill Creek for which a long record of evaporation data is available is North Battleford. Gross evaporation at this station was considered representative of the evaporation from open water surfaces in the Eyehill Creek Basin. Evaporation data for the period 1912-1980 at North Battleford was provided by PFRA (5) and is given in Table B-2 of Appendix B. Net evaporation data for the Eyehill Creek Basin is given in Table B-3 of Appendix B.

BASIN WATER USE

Seventeen water use projects are known to have been constructed and operated within the effective basin of Eyehill Creek during the period 1912-1980. Projects located upstream of the hydrometric stations on Eyehill Creek affected the streamflow being recorded at those stations. Projects in the Alberta portion of the basin affected the streamflow at the interprovincial boundary. The effect on streamflow at the interprovincial boundary was determined by computing monthly depletion of streamflow at all projects in the Alberta portion of the basin for the period 1912-1980. The effect of the projects on streamflow recorded at the hydrometric stations was determined by computing monthly depletion of streamflow at all projects upstream of the stations for the period 1920-1930, 1936, and 1967-1980.

Streamflow depletion includes only those losses which are directly attributable to a man-made project and is the sum of:

1. water withdrawal from the stream or reservoir for human or livestock use, less the portion of this withdrawal which is returned to the stream or reservoir,
2. net evaporation and seepage losses from the reservoir, less the net evaporation and seepage losses from the reservoir site in its natural state, and

3. change in storage over the specified time interval, less the corresponding change in storage at the site in its natural state.

Of course, the streamflow depletion at a project over a specified period of time cannot exceed the natural streamflow, and the change in storage cannot exceed the total reservoir capacity.

Information was obtained for all authorized water use projects in the effective basin from the Water Rights Branch of Alberta Environment and the Water Rights Branch of Saskatchewan Environment. Available information included land location, reservoir dimensions, and authorized water use. The period of operation for each project was not recorded in the water rights files, but in this study was assumed to commence in the year following authorization and to end in the year prior to the year of cancellation, unless additional information could be obtained from the project owners. All of the existing authorized projects were inspected during a reconnaissance of the basin in November 1981. Pertinent data for the authorized projects is included in Table C-1 of Appendix C. The locations of the projects are shown in Figure 2.

A number of unauthorized water use projects in the effective basin were identified during a review of aerial photographs taken in 1974 and 1978 and during the reconnaissance of the basin in November 1981. Some of the unauthorized projects in the Alberta portion of the Eyehill Creek Basin were identified and inspected in 1980 by Alberta Environment as part of a natural flow study of Sounding Creek. Pertinent data for the unauthorized projects were obtained during the November 1981 reconnaissance, from inspection reports provided by Alberta Environment, and from the aerial photographs. The data are included in Table C-1 of Appendix C. The locations of the projects are shown on Figure 2.

Very little information was available on the operation of the various projects. For the authorized projects, the annual allocation is meant to be the upper limit of usage, but does not provide an accurate indication of the actual monthly usage. The only data on actual water use were a number of water level measurements provided by Ducks Unlimited for several of their projects in the basin.

The following assumptions regarding water use were made in order that monthly streamflow depletion could be estimated:

1. The monthly withdrawal from the CPR project on Macklin Lake (Project No. 16), was constant and equal to 1/12 of the authorized annual use, providing sufficient water was available.
2. Except for Project No.16, the only water withdrawals have been for livestock watering. The consumptive use by livestock in the basin was estimated to be 1.0 m^3/day per square kilometre of effective drainage area during May-October of each year. This estimate was based on the results of a study by Culler and Peterson (3) and data obtained during the site reconnaissance. There has been no irrigation or human consumption of surface water in the effective basin of Eyehill Creek.
3. The Macklin Lake storage project has released water into Eyehill Creek at a rate equal to the flow recorded at WSC Station No. 05GA007. Runoff from the 1.0 km^2 area between the project and the gauge has been insignificant for the purpose of this study.
4. Gross evaporation from lakes and reservoirs may be approximated by the gross evaporation computed for North Battleford by PFRA (5). Reservoirs did not affect evaporation in the basin during

the months of November to March, since they would have been covered by ice and snow during those months. Precipitation on lakes and reservoirs is equal to precipitation recorded at Macklin. For periods of missing data at Macklin, recorded precipitation at Provost or North Battleford may be used.

5. Seepage losses from all projects are negligible.

For the computation of monthly streamflow depletion, a water accounting model was developed. The model provided, with the limited data available, and in accordance with the constraints of each project, estimates of the depletion of streamflow at each project upstream of the two hydrometric stations on Eyehill Creek. Initial conditions for each project were assumed on the basis of field observations and information from project owners. Due to the relatively small size of the basin, adjustments for travel time were not required. The only significant natural storage in the effective drainage basin is in Macklin Lake and Hallam Lake. The model computed the losses from the two lakes for both the natural conditions and the man-made conditions. Only the incremental losses due to human interference were included in the overall net depletion of streamflow. Input data to the model included an estimate of the monthly unregulated inflow to each project. The following procedures were used to estimate the monthly unregulated inflow to each project upstream of WSC Station No. 05GA001 during the period 1920-1930 and 1936, and to each project upstream of WSC Station No. 05GA007 during the period 1967-1980.

1. For the period 1920-1930 and 1936, the unregulated inflow was assumed equal to the recorded flow at WSC Station No. 05GA001 on Eyehill Creek, pro-rated according to drainage area ratio.

This was considered to be a reasonable assumption due to the very limited use of water in the Eyehill Creek Basin during that period. The amount of unregulated inflow was increased by 35 000 m^3 per month for Project No. 16 because of higher runoff in the Macklin Lake Basin. The higher runoff is caused by springs and produces relatively high water levels in Macklin Lake throughout the year. It was found, using the water accounting model, that a monthly yield of 35 000 m^3 from the springs would produce water levels and lake outflow similar to those observed at Macklin Lake by local residents during recent years.

2. For the period 1967-1980, the flow at WSC Station No. 05GA007 on Eyehill Creek was greatly regulated and could not be used to estimate monthly unregulated inflow to the upstream projects. Therefore, the unregulated inflow for this period was assumed equal to the natural flow at WSC Station No. 05GA003 on Monitor Creek, pro-rated according to drainage area ratio. This was considered to be a reasonable assumption since Monitor Creek is near Eyehill Creek (see Figure 1) and has similar climatic, physiographic and hydrologic characteristics. The derivation of natural flows for Monitor Creek is discussed in the following chapter. The inflow to Macklin Lake was increased by 35 000 m^3 per month as in (1) above.

The estimated monthly net depletion of streamflow upstream of WSC Station No. 05GA007 for its period of operation, 1967-1980, is presented in Table C-2 of Appendix C. The net depletion of streamflow upstream of WSC Station No. 05GA001 was found to be negligible for all

months during its period of operation from 1920 to 1930, and 1936. The net depletion values in Table C-2 were used in the computation of natural flows for the two hydrometric stations on Eyehill Creek. The procedure is outlined in the next chapter.

The natural flows computed for WSC Station No. 05GA007 on Eyehill Creek (see next chapter) were used with the water accounting model to compute monthly net depletions at projects upstream of the Alberta-Saskatchewan boundary for the period 1912-1980. The monthly unregulated inflow to each project was assumed equal to the natural flow at WSC Station No. 05GA007, pro-rated according to drainage area ratio. The net depletion of streamflow in the Alberta portion of the effective drainage basin for the period 1912-1980 is given in Table C-3 of Appendix C. March-October net depletion varied from zero to a high of approximately 150 dam^3.

An additional computation was made using the water accounting model to determine what the monthly net depletion would have been during the period 1912-1980 if the level of development in the basin had been equal to the 1980 level for the entire period. Again, the monthly unregulated inflow to each project was assumed equal to the natural flow at WSC Station No. 05GA007, pro-rated according to drainage area ratio. The results in Table C-4 of Appendix C show that the March-October net depletion would have varied from approximately 28 dam^3 to approximately 180 dam^3, with a mean of approximately 98 dam^3.

NATURAL FLOW CALCULATIONS

Natural flow is the flow of water which would occur at a particular site if there was no upstream human interference. Natural flows can be estimated for a site having recorded flows by adding the depletion of streamflow caused by upstream projects to the recorded flows. This method was used to estimate monthly natural flows at WSC Station No. 05GA003 on Monitor Creek for the period 1954-1980 and at WSC Station No. 05CH002 on Berry Creek for the period 1921-1953. Data on streamflow depletion in the Berry Creek Basin were obtained from a report by Alberta Environment (1). Streamflow depletion in the Monitor Creek Basin was estimated for the period 1954-1980 using the water accounting model discussed in the previous chapter, together with project data provided by Alberta Environment, PFRA, Ducks Unlimited, aerial photographs, and local residents. The monthly unregulated inflow to each project was assumed equal to the recorded flow at WSC Station No. 05GA003 on Monitor Creek, pro-rated according to drainage area ratio. The estimated natural flows for Monitor Creek are presented in Table D-1, Appendix D.

The Monitor Creek natural flows were used, as discussed in the previous chapter, in the computation of streamflow depletion at

water use projects upstream of the two hydrometric stations in the Eyehill Creek Basin. Monthly natural flows at WSC Station No. 05GA007 on Eyehill Creek were then computed for the period 1967-1980 by adding the net depletions in Table C-2 to the recorded flows in Table A-2. Due to negligible net depletion during the period 1920-1930, and 1936, the natural flows at WSC Station No. 05GA001 during that period were assumed equal to the recorded flows in Table A-1.

The natural flows at WSC Station No. 05GA001 were then prorated to WSC Station No. 05GA007 on the basis of drainage area ratio, thus giving the latter station a period of natural flow record from 1920 to 1930, 1936, and 1967 to 1980. These monthly natural flows are included in Table D-2 of Appendix D. Monthly natural flows for the balance of the period 1912-1980 were estimated using equations derived by regression analyses. The dependent variables in the regression analyses were the monthly flows in Eyehill Creek at WSC Station No. 05GA007. A large number of independent variables were tried in the regression analyses, including natural flows for three other rivers in the region, meteorological parameters, and antecedent moisture or basin storage conditions. Details of the regression analyses are given in Table D-4.

The computer program LACOR4 was used for all simple regression analyses in which the independent variable was natural flow for a river other than Eyehill Creek. The program is based on the Langbein method in which the flows are transformed to log units and the correlations are carried out using the deviations of the individual transformed flows from the mean of the transformed flows. Because of the logarithmic transformation, the program cannot correlate zero flows. Therefore, all zero flows were increased to 0.001 m^3/s before carrying out the regression analysis.

The multiple regression analyses were performed using the computer program MULCOR. The "backward elimination" method was used in the multiple regression analyses to eliminate insignificant parameters. Only the final result of each multiple regression analysis is given in Table D-4.

Data on natural flow in the Battle River were obtained from a report by Alberta Environment (2). Precipitation data were presented in Table B-1 of Appendix B. Temperature data were obtained from the Environment Canada publication "Monthly Record of Meteorological Observations in Canada". Temperature data for Macklin were supplemented by temperature data for Battleford, North Battleford, and Qu'Appelle, Saskatchewan.

The results of the regression analyses were compared on the basis of correlation coefficient and standard error estimate. Consideration was also given to the length of period upon which each regression was based and the relative accuracy of the data itself. The equations presented in Table 1 were selected for completing the record of natural flows in Eyehill Creek. The period for which each equation is applicable, is indicated. The natural flows estimated by these equations are included in Table D-2 of Appendix D.

Natural flows in Eyehill Creek at the Alberta-Saskatchewan boundary were estimated by pro-rating the flows in Table D-2 according to the ratio of effective drainage areas. The results are presented in Table D-3 of Appendix D.

TABLE 1

REGRESSION EQUATIONS USED TO COMPLETE NATURAL FLOW RECORD

Month	Years	Regression Equation	Correlation Coefficient	Standard Error in % of Mean Q_E	Priority Number
March	1912-20,30-35,37-53	$Q_E = -.20 + .0018P_{Nov.-Mar.} + .0018T_{Mar.}$	.74	140	2
	1954-66	$\log Q_E = -.19 + .91 \log Q_M$	.95	90	1
April	1912-20,31-35,37-53	$Q_E = -.74 + .016P_{Sep.-Oct.} + .010P_{Nov.-Mar.} - 2.6Q_{Mar.}$	.87	60	2
	1954-66	$\log Q_E = -.24 + .89 \log Q_M$	.93	55	1
May	1912-19,31-35,37-53	$Q_E = .19 + .0015P_{May} - .46Q_{Mar.} + .017Q_{Apr.}$	.40	78	2
	1954-66	$\log Q_E = -.65 + .44 \log Q_M$	.62	160	1
June	1912-19,31-35,37-53	$Q_E = -.02 + .001P_{Jun.} - .12Q_{Apr.} + .73Q_{May}$	.84	33	2
	1954-66	$\log Q_E = -.14 + .89 \log Q_M$	.89	120	1
July	1912-19,31-53	$Q_E = -.05 + .0009P_{Jul.} + .48Q_{Jun.}$	.76	81	2
	1954-66	$\log Q_E = .09 + .97 \log Q_M$	.80	140	1
August	1912-19,31-53	$Q_E = .01 + .0010P_{Aug.} + .24Q_{Jul.}$	.67	41	2
	1954-66	$\log Q_E = -.15 + .84 \log Q_M$	.62	270	1
September	1912-19,31-53	$Q_E = .03 + .0005P_{Sep.} + .40Q_{Aug.}$	.69	33	2
	1954-66	$\log Q_E = -.08 + .79 \log Q_M$	.69	220	1
October	1912-19,31-53	$Q_E = .02 + .85Q_{Sep.}$	.64	86	2
	1954-66	$\log Q_E = -.52 + .65 \log Q_M$	.59	220	1

EXPLANATION OF SYMBOLS:

Q_E = natural flow at WSC Station No. 05GA007 on Eyehill Creek near Macklin for the month indicated, in cubic metres per second.

$Q_{Mar.}$ = natural flow at WSC Station No. 05GA007 on Eyehill Creek near Macklin for the month of March, in cubic metres per second; similarly for April ($Q_{Apr.}$), May (Q_{May}), June ($Q_{Jun.}$), July ($Q_{Jul.}$), August ($Q_{Aug.}$), and September ($Q_{Sep.}$).

Q_M = natural flow at WSC Station No. 05GA003 on Monitor Creek near Monitor for the month indicated, in cubic metres per second.

$P_{Sep.-Oct.}$ = total precipitation in the Eyehill Creek Basin during September and October of the preceding year, in millimetres.

$P_{Nov.-Mar.}$ = total precipitation in the Eyehill Creek Basin from November of the preceding year to March of the current year, in millimetres.

P_{May} = precipitation in the Eyehill Creek Basin during May of the current year, in millimetres; similarly for June ($P_{Jun.}$), July ($P_{Jul.}$), August ($P_{Aug.}$), and September ($P_{Sep.}$).

$T_{Mar.}$ = temperature index for the month of March in the current year, computed as follows:

$$T_{Mar.} = \sum_{i=1}^{31} T'_{Mar.,i}$$

where $T'_{Mar.,i}$ is the maximum temperature on the i^{th} day of March, in degrees Celsius, if the maximum temperature exceeds 0.0°C.

NOTES: See next page

TABLE 1 (continued)

NOTES:

1. The correlation coefficients represent the degree of correlation between the dependent variables and the corresponding independent variables. Where the dependent and independent variables are in logarithmic units, the correlation coefficients represent the degree of correlation between the logarithms of the flows.

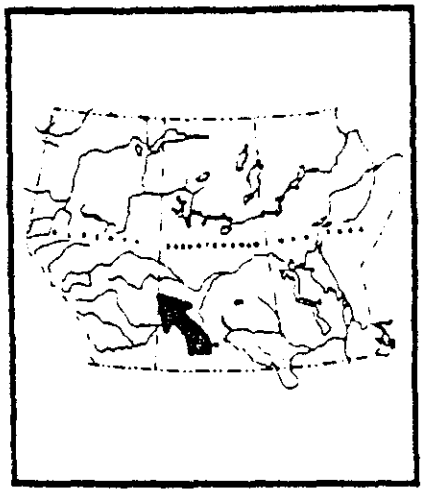
2. Standard error is a measure of the accuracy of flows estimated by a particular equation. An equation with variables in logarithmic units will over-estimate flows to a greater degree than it will under-estimate flows. For example, the standard error of an equation with variables in logarithmic units could have a lower limit of -50 percent and an upper limit of +100 percent. For ease of comparison, the standard errors in this table were computed as the average of the absolute values of the upper and lower limits.

3. Priority number indicates the relative reliability of regression equations for a particular month. Priority number 1 denotes the most reliable equation while priority number 2 denotes the second most reliable equation. Priorities were established on the basis of correlation coefficients, standard errors, length of record on which each correlation is based, accuracy of the independent variables, and the overall hydrologic validity of each equation.

PRESENT USE FLOW CALCULATIONS

Under the terms of the 1969 Master Agreement on Apportionment, the Province of Alberta is permitted "to make a net depletion of one-half the natural flow of water arising in or flowing through the Province of Alberta" and must allow "the remaining one-half of the natural flow of water of each such watercourse to flow into the Province of Saskatchewan .....". To determine if the present (1980) level of development in the Alberta portion of the Eyehill Creek Basin is sufficient to cause a violation of this agreement, the monthly net depletions in Table C-4 were compared with the natural flow in Table D-3. Table E-3 of Appendix E shows the proportion of natural flow which would have been depleted by the present Alberta water use projects. The net depletion in the Alberta portion of the basin would have been less than 50% of the natural flow at the interprovincial boundary in all but one of the March-October periods between 1912 and 1980. In 1961, one of the driest years in the Eyehill Creek Basin between 1912 and 1980, approximately 52% of the natural flow at the boundary would have been depleted by projects in the Alberta portion of the basin. For comparison, Table E-1 shows the proportion of natural flow which was depleted by Alberta water use projects during the same period.

Table E-4 of Appendix E shows the monthly flow in excess of its 50% share that Saskatchewan would have received during the period 1912-1980 if the level of development during that period had been equal to the present (1980) level of development. Saskatchewan would have received, on average, a March-October flow of 1100 dam^3 in excess of its 50% share. For comparison, Table E-2 shows the actual flow received by Saskatchewan in excess of its 50% share.



DISCUSSION OF PROCEDURE FOR DETERMINING NATURAL FLOW

If it becomes necessary to formally monitor the apportionment of streamflow in the Eyehill Creek basin, natural flow would have to be performed on a regular up-to-date basis, to ensure that both Alberta and Saskatchewan are receiving their share of the flow. The Project Depletion Method, which was used to compute the natural flows for Monitor Creek in Table D-1, and the unshaded natural flows for Eyehill Creek in Table D-2, would be used to compute natural flows for Eyehill Creek.

NATQ, the computerized water accounting model for the computation of natural flow, incorporates the Project Depletion Method and was used to produce natural flows for the report. A documentation and user manual for NATQ accompanies this report as Appendix F, separately bound. Program NATQ is a water accounting model which was developed to compute the natural flow in small drainage basins for which little water use data is available. The options and capabilities of the program are as follows:

1. The program is written in Fortran IV, using metric units;
2. The following estimates may be obtained as output from the program:
   (a) historic natural flow at a gauging station;
   (b) historic net depletion of streamflow at selected projects and the total net depletion;

(c) historic estimated actual flow at any point in this basin;

(d) historic flow in excess of 50% natural flow at any point in the basin; and

(e) historic proportion of natural flow which has been depleted by selected projects in the basin.

3. The program is dimensioned to accept a maximum of 25 water use projects and a length of streamflow record equal to 40 years. The program may, however, be re-dimensioned to suit each particular case;

4. Water use computations are performed sequentially from the uppermost part of the basin to the downstream end of the basin. The outflow from one project forms part of the inflow to the adjacent downstream project;

5. A subroutine calculates surface water areas from volume-area curves. Volume-area curves are required as input to those reservoirs having significantly non-linear relationships between surface area and volume of storage;

6. A subroutine calculates project inflow, outflow and net depletion;

7. Calculations may be performed for entire years or for just the March-October season. The latter option is useful when winter streamflow is zero or insignificant.

The Project Depletion Method was described by Environment Canada (6) and is based on the equation:

$$Q_{Nat.} = Q_{Rec.} + N.D.$$

where: $Q_{Nat.}$ is the natural flow at the hydrometric station,

$Q_{Rec.}$ is the recorded flow at the hydrometric station, and

N.D. is the net depletion of streamflow at upstream projects.

The net depletion of streamflow at a project should be computed as the sum of:

1. water withdrawal for human or livestock use, less the portion of this withdrawal which is returned to the stream or reservoir,
2. net evaporation from the reservoir; net evaporation equals gross evaporation minus precipitation,
3. change in reservoir storage over the specified time interval; an increase in storage is considered a positive (+) net depletion while a decrease in storage is considered a negative (-) net depletion.

The computed natural flows to be used for monitoring the apportionment agreement would have to be much more accurate than the estimated natural flows in Table D-3 for Eyehill Creek at the Alberta-Saskatchewan boundary. To achieve the required accuracy, streamflow should be recorded at the interprovincial boundary and water use at the largest stream projects should be monitored on a regular basis. At present, the only projects for which operating records are kept are those projects operated by Ducks Unlimited. Projects No. 9, 10 and 11 in Table C-1 are presently the largest projects in the basin upstream of the interprovincial boundary. The other projects in Table C-1 have little or no impact on the streamflow at the interprovincial boundary and may be omitted from future natural flow computations.

Net evaporation at project reservoirs should be determined using evaporation and rainfall data collected at one or more meteorological stations in the vicinity of the Eyehill Creek basin. The meteorological station at Kindersley would be suitable for this purpose. The equation to be used for net evaporation at a project is:

$$N.E._{project} = 0.70\ G.E._{pan} - P$$

where: $N.E._{project}$ is the net evaporation (in millimetres) from a project reservoir,

$G.E._{pan}$ is the gross evaporation (in millimetres) from a Class "A" evaporation pan at the meteorological station and

P is the recorded precipitation at the meteorological station.

The volume of net evaporation from a project reservoir is obtained by multiplying the depth of net evaporation by the surface area of the reservoir at its mean elevation for the selected period.

It is suggested that a one-month time step be used in the computation of natural flows at the Alberta-Saskatchewan boundary. All input and output data would be monthly mean values. While this time step is relatively long for the accurate computation of natural flow, it would be impracticable to obtain water use data in the Eyehill Creek basin on a more frequent basis.

CONCLUSIONS AND RECOMMENDATIONS

The March-October natural flow of Eyehill Creek at the Alberta-Saskatchewan boundary for the period 1912 to 1980 varied between approximately 110 dam^3 and approximately 6000 dam^3, with a mean of approximately 2400 dam^3. In the same period the March-October net depletion in the Alberta portion of the effective basin varied between zero and 150 dam^3. The net depletion in the Alberta portion of the basin did not exceed 18% of the natural flow at the interprovincial boundary in any March-October period between 1912 and 1980. The Master Agreement on Apportionment was therefore not violated on an annual basis during that period.

The present level of water resources development in the Alberta portion of the basin is sufficient to cause a violation of the 1969 Master Agreement on Apportionment in an extremely dry March-October period. If the level of development in the Alberta portion of the basin over the entire period 1912-1980 had been equal to the 1980 level of development, the March-October net depletion in the Alberta portion would have varied from approximately 28 dam^3 to approximately 180 dam^3, with a mean of approximately 98 dam^3. The net depletion in the Alberta portion of the basin would have exceeded 50% of the natural flow at the interprovincial boundary in one March-October period between 1912 and 1980. During the

period of 1912-1980, Saskatchewan would have received from Alberta, on average, a March-October flow of about 1100 dam^3 in excess of its 50% share.

IT IS RECOMMENDED THAT A HYDROMETRIC STATION BE CONSTRUCTED ON EYEHILL CREEK AT THE ALBERTA-SASKATCHEWAN BOUNDARY. One hydrometric station (05GA007) is currently being operated on Eyehill Creek; however, the station is poorly situated in terms of providing an accurate representation of the flow at the Alberta-Saskatchewan boundary. One reason is that the station is located just downstream of a large storage project for which no operational records are kept. Another reason is that the effective drainage area at the interprovincial boundary is just 68% of the effective drainage area at the existing hydrometric station.

The lack of data on water uses within the Eyehill Creek Basin was a serious problem in the computation of streamflow depletion and undoubtedly affected the accuracy of the results of this study. When apportionment becomes necessary, all projects should be inspected and operational records should be kept for projects which have significant effect on streamflow at the gauging site or at the interprovincial boundary.

The contributions of Sounding Lake, Eyehill Lake and Cosine Lake to Eyehill Creek flows were assumed negligible for the purpose of this study. When apportionment becomes necessary, the effective basin of Eyehill Creek should be verified using a water balance model.

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in the Eyehill Creek and Monitor Creek basins. The Prairie Farm Rehabilitation Administration (PFRA) provided data on gross and effective drainage areas. PFRA also provided data on net evaporation, air photos of the Eyehill Creek Basin, and information on the Macklin Lake, Consort, and Loyalist storage projects. Valuable information on historic flows, historic water levels, and project operation, was provided by a number of residents in the Eyehill Creek and Monitor Creek basins, including Mr. G. Gallinger (Macklin), Mr. I. McIntyre (Macklin), Mr. E. Guttormson (Sounding Lake), Mr. L. Schaeffer (Consort), Mr. A. Spencer (Consort), and Mr. Trieber, (Consort).

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APPENDIX A

RECORDED STREAMFLOW DATA

TABLE A - 1
EYEHILL CREEK NEAR YUNKER - STATION NO. 05GA001
RECORDED FLOW IN CUBIC METRES PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN FOR MAR-OCT	VOLUME DAM^3
1912	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1913	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1914	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1915	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1916	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1917	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1918	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1919	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1920	-	-	-	-	1.02	.518	.312	.180	.249	.304	-	-	-	-
1921	-	-	.000*	3.66	1.16	.411	.277	.164	.233	.194	-	-	.754	16000
1922	-	-	.000*	.930	.645	.257	.155	.130	.123	.142	-	-	.296	6270
1923	-	-	.000*	.270	.369	.319	.381	.365	.172	.196	-	-	.259	5480
1924	-	-	.000*	.122	1.15	.868	.258	.136	.127	.141	-	-	.350	7410
1925	-	-	.058	1.31	.355	.329	.144	.094	.100	.139*	-	-	.313	6620
1926	-	-	.072	.704	.328	.267	.085	.104	.109	.108	-	-	.220	4660
1927	-	-	.000	1.01	.643	.601	.507	.257	.257	.609	-	-	.484	10300
1928	-	-	.186	1.79	.869	.489	.318	.128	.115	.145	-	-	.502	10600
1929	-	-	.000	.321	.613	.242	.133	.068	.092	.151	-	-	.202	4280
1930	-	-	-	.445	.260	.424	.753	.154	.146	.233	-	-	-	-
1931	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1932	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1933	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1934	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1935	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1936	-	-	.038	1.10	.430	.159	-	-	-	-	-	-	-	-
1937	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1938	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1939	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1940	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1941	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1942	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1943	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1944	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1945	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1946	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1947	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1948	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1949	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1950	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1951	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1959	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1960	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1961	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1965	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1967	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1968	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1970	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1971	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1972	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1973	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1974	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1975	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1976	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1977	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1978	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1979	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	-	-	.035	1.06	.654	.407	.302	.162	.157	.215	-	-	.376	7960
MAX	-	-	.186	3.66	1.16	.868	.753	.365	.257	.609	-	-	.754	16000
MIN	-	-	.000	.122	.260	.159	.085	.068	.092	.108	-	-	.202	4280

* ---- MONTHLY FLOW ESTIMATED FROM AN INCOMPLETE RECORD OF DAILY FLOWS FOR THAT MONTH

TABLE A - 2
EYEHILL CREEK NEAR MACKLIN - STATION NO. 05GA007
RECORDED FLOW IN CUBIC METRES PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN FOR MAR-OCT	VOLUME DAM^3
1912	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1913	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1914	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1915	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1916	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1917	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1918	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1919	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1920	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1921	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1922	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1923	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1924	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1925	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1926	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1927	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1928	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1929	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1930	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1931	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1932	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1933	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1934	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1935	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1936	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1937	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1938	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1939	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1940	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1941	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1942	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1943	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1944	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1945	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1946	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1947	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1948	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1949	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1950	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1951	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1959	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1960	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1961	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1965	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	-	-	-	.003	-	-	-	-
1967	-	-	.000	.156	.520	.156	.037	.001	.000	.000	-	-	.109	2300
1968	-	-	.302	.050	.008	.004	.001	.001	.083	.127	-	-	.072	1530
1969	-	-	.000	2.38	.163	.057	.000	.000	.000	.004	-	-	.319	6750
1970	-	-	.000	.641	.047	.066	.021	.268	.028	.000	-	-	.133	2810
1971	-	-	.000	1.77	.036	.084	.006	.340	.019	.030	-	-	.281	5960
1972	-	-	.133	.196	.025	.014	.000	.000	.203	.044	-	-	.076	1610
1973	-	-	.000	.002	.001	.190	.420	.001	.060	.010	-	-	.086	1820
1974	-	-	.000	1.51	.112	.117	.000	.041	.008	.000	-	-	.220	4650
1975	-	-	.000	.002	.726	.286	.051	.026	.005	.001	-	-	.138	2910
1976	-	-	.000	.495	.091	.140	.076	.000	.026	.040	-	-	.107	2270
1977	-	-	.000	.003	.002	.002	.006	.004	.000	.000	-	-	.002	45.6
1978	-	-	.000	.002	.001	.000	.018	.000	.001	.000	-	-	.003	60.3
1979	-	-	.000	.506	.237	.001	.000	.000	.000	.000	-	-	.092	1950
1980	-	-	.003	.313	.138	.000	.000	.000	.000	.000	-	-	.057	1190
MEAN	-	-	.031	.573	.150	.080	.045	.048	.031	.017	-	-	.121	2560
MAX	-	-	.302	2.38	.726	.286	.420	.340	.203	.127	-	-	.319	6750
MIN	-	-	.000	.002	.001	.000	.000	.000	.000	.000	-	-	.002	45.6

APPENDIX B

METEOROLOGICAL DATA

TABLE B - 1
EFFECTIVE DRAINAGE BASIN OF EYEHILL CREEK
PRECIPITATION IN MILLIMETRES

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1912	.5	.3	5.1	.8	29.7	30.0	135.9	69.6	52.3	14.0	10.2	12.7	361.1
1913	12.7	5.1	7.6	0.0	11.7	43.2	90.4	67.1	27.2	4.6	2.6	.3	272.5
1914	17.5	[illegible].2	20.3	13.7	72.6	62.7	32.5	58.4	100.8	57.4	18.8	20.8	486.0
1915	0.0	5.0	0.0	17.3	40.9	35.3	80.8	5.6	17.0	8.1	7.6	5.1	220.7
1916	19.3	.5	25.4	18.5	70.4	93.0	53.6	119.4	26.7	18.0	.3	5.6	450.7
1917	27.4	5.1	7.6	31.2	9.1	19.3	20.1	47.8	13.5	4.6	4.6	18.0	208.3
1918	3[illegible]	4.4	30.6	23.4	26.2	25.7	31.0	21.8	6.1	11.4	3.0	16.0	248.0
1919	[illegible]	7.6	14.5	6.1	18.8	33.5	7.1	63.2	46.7	19.8	14.7	9.7	260.5
1920	36.[illegible]	9.1	17.8	24.4	63.8	81.8	101.1	70.9	36.3	46.5	5.6	5.1	499.0
1921	2[illegible]	36.6	16.3	101.3	43.7	46.0	96.5	19.6	71.1	8.9	21.3	5.1	486.7
1922	5.1	7.6	16.5	15.2	61.0	9.1	19.8	47.8	10.9	29.5	.3	11.2	234.0
1923	14.[illegible]	2.5	6.6	2.0	13.0	144.8	102.9	71.4	15.2	8.1	2.0	5.6	388.1
1924	10.7	16.8	3.3	8.9	42.4	1.8	38.6	73.1	22.6	10.4	23.4	13.2	265.2
1925	12.4	15.2	12.7	45.5	3.3	110.0	33.0	21.6	23.1	24.9	2.5	2.5	306.7
1926	6.1	13.5	4.6	16.3	59.7	24.1	19.3	39.9	28.2	11.2	20.3	11.9	255.1
1927	2.5	3.8	7.6	26.4	88.6	59.2	143.8	19.3	50.3	16.8	10.7	3.6	432.1
1928	2.5	3.6	16.0	16.8	27.4	74.2	47.2	24.4	2.3	15.0	.3	5.6	235.3
1929	7.9	10.7	3.0	12.7	31.8	8.1	13.4	18.5	12.2	2.3	14.7	24.4	159.7
1930	8.1	16.3	8.1	43.7	31.0	130.0	92.5	14.0	103.4	36.8	3.3	3.8	491.0
1931	.3	.8	6.4	.5	12.4	47.8	84.1	21.1	49.5	4.3	17.0	21.6	265.8
1932	41.1	.5	4.1	92.5	26.2	80.8	52.3	33.5	46.7	12.7	8.4	13.2	412.0
1933	10.2	11.7	33.3	22.6	50.5	26.9	13.7	6.6	50.0	33.5	21.3	38.1	318.4
1934	8.9	6.6	6.1	29.7	9.7	56.6	26.7	37.8	28.4	.5	11.2	41.1	265.3
1935	21.6	3.3	10.9	25.6	27.7	85.3	41.4	23.6	15.0	21.6	31.0	8.1	315.1
1936	11.9	9.1	1.5	8.4	21.3	33.5	20.1	41.4	24.4	9.9	1.0	38.6	221.1
1937	15.5	13.7	.3	10.7	46.5	19.8	41.1	49.8	46.5	40.1	20.1	15.0	319.1
1938	15.5	22.4	17.8	10.4	73.4	47.4	43.4	40.1	12.2	48.8	36.6	25.4	393.4
1939	15.5	13.7	6.6	15.2	30.0	116.1	32.0	22.4	19.8	19.0	11.4	30.5	332.2
1940	4.1	14.2	5.6	27.9	54.9	88.6	41.4	7.9	22.1	57.1	28.2	11.2	363.2
1941	14.5	9.9	5.6	11.2	37.6	32.8	59.7	74.7	28.4	8.1	9.1	6.1	297.7
1942	5.8	.3	7.1	36.8	26.4	70.9	77.7	29.5	32.0	8.6	17.0	19.3	331.4
1943	19.0	16.8	33.0	6.9	120.1	61.7	27.4	84.8	19.0	42.9	11.2	3.0	445.8
1944	11.4	16.5	17.3	15.0	44.4	118.1	134.4	125.7	29.7	1.8	11.9	6.4	532.6
1945	32.3	20.3	2.5	22.9	14.7	36.1	56.9	55.1	40.1	6.1	11.9	7.6	306.5
1946	15.5	29.2	5.1	14.0	21.6	100.1	27.4	80.5	49.8	46.0	25.9	17.3	432.4
1947	10.2	15.2	10.2	15.2	14.2	65.0	22.6	34.0	72.4	24.9	11.9	30.5	326.3
1948	11.4	51.6	4.8	51.1	23.9	18.8	35.6	17.0	6.6	7.1	24.1	27.4	279.4
1949	30.2	13.5	14.2	20.8	55.1	24.6	66.0	14.7	27.9	15.2	25.1	30.5	337.8
1950	22.4	2.3	0.0	13.0	19.8	54.9	122.7	46.7	13.7	61.5	0.0	7.1	364.1
1951	10.7	1.5	30.5	17.3	30.2	41.4	117.1	59.4	10.9	25.9	1.8	8.6	355.3
1952	14.2	1.5	30.5	.8	30.5	80.0	94.5	26.9	14.2	5.6	1.5	0.0	300.2
1953	2.8	0.0	35.3	32.5	25.4	26.7	123.4	35.1	9.1	.3	2.5	16.0	309.1
1954	22.1	6.4	5.6	10.9	60.5	40.4	65.0	170.2	43.4	1.8	5.8	1.8	433.9
1955	12.7	1.3	17.8	62.7	18.3	51.1	45.7	10.4	38.6	11.7	9.9	62.2	342.4
1956	6.9	27.2	27.9	2.5	5.6	179.8	20.8	21.8	27.4	2.8	4.6	38.9	368.2
1957	8.9	2.5	34.8	6.9	7.9	28.2	45.0	129.3	21.3	21.1	9.7	10.2	325.8
1958	17.8	13.5	19.0	4.3	46.0	20.3	33.0	17.3	41.9	.5	28.4	21.6	263.6
1959	7.6	12.7	2.5	12.7	18.6	58.7	30.2	68.3	61.2	48.5	10.2	2.5	333.7
1960	5.1	14.0	12.7	13.0	25.4	27.9	42.2	131.1	6.8	7.4	7.6	11.4	304.6
1961	11.4	27.9	15.7	17.0	39.9	113.0	58.4	4.1	12.4	41.4	17.0	12.7	370.9
1962	30.5	36.8	25.4	14.5	14.0	65.3	133.1	66.3	43.9	3.8	25.9	17.8	477.3
1963	33.3	30.5	22.9	71.1	49.5	134.6	84.8	74.7	19.6	5.1	21.3	17.5	564.9
1964	27.4	26.7	3.8	20.3	69.1	52.1	72.1	44.4	99.6	18.5	8.9	40.9	483.8
1965	35.6	41.9	3.3	3.8	51.3	213.1	31.5	54.6	22.9	0.0	13.5	16.3	488.0
1966	29.7	11.2	30.5	5.6	18.3	64.3	88.9	79.0	2.0	5.6	40.4	7.9	383.4
1967	12.7	20.3	38.1	22.9	7.6	75.2	67.1	20.6	0.0	27.4	27.7	28.7	348.3
1968	20.5	9.1	11.4	10.2	58.4	45.2	89.7	61.8	97.3	23.6	3.0	24.1	474.1
1969	58.4	20.3	10.2	23.4	32.3	14.0	69.6	14.7	59.7	18.8	15.2	20.3	356.9
1970	11.4	10.2	25.4	.3	7.9	127.8	75.2	15.2	0.0	50.8	22.8	33.0	380.0
1971	45.7	10.2	16.5	10.2	7.1	83.1	119.4	114.5	11.2	13.2	27.9	30.5	489.5
1972	35.6	31.8	7.1	5.1	9.9	40.1	94.2	29.5	30.2	4.6	14.5	11.7	314.3
1973	3.8	12.2	17.0	31.0	20.3	92.7	64.5	106.2	16.8	11.9	26.4	22.4	425.2
1974	39.4	13.2	51.3	26.4	39.1	72.6	79.5	51.6	23.4	2.8	0.0	11.7	411.0
1975	23.9	24.4	21.6	63.8	66.8	76.2	63.5	56.6	5.1	36.3	8.1	32.3	478.6
1976	12.4	12.2	26.2	23.1	20.1	89.2	123.4	52.1	14.7	2.8	1.8	29.2	407.2
1977	23.6	2.5	2.6	18.3	117.7	16.5	35.6	39.2	65.5	.8	4.8	16.3	343.4
1978	11.4	7.6	6.3	80.4	71.0	30.2	59.9	56.9	50.6	18.8	39.3	17.9	450.3
1979	4.7	32.6	14.4	16.0	36.0	90.8	76.5	66.4	15.6	10.6	2.4	11.8	385.8
1980	24.0	13.5	36.0	7.0	27.2	91.0	83.6	53.2	24.2	24.0	5.0	21.5	410.2
MEAN	17.2	13.4	14.9	21.9	36.3	63.2	63.4	50.3	31.7	18.5	13.2	17.0	360.9
MAX	58.4	51.6	51.3	101.3	120.1	213.1	143.8	170.2	103.4	61.5	40.4	62.2	564.9
MIN	0.0	0.0	0.0	0.0	3.3	1.8	7.1	4.1	0.0	0.0	0.0	0.0	159.7

Shaded area denotes precipitation recorded at North Battleford.

Shaded area denotes precipitation recorded at Provost.

Unshaded area denotes precipitation recorded at Macklin.

TABLE B-2
EFFECTIVE DRAINAGE BASIN OF EYEHILL CREEK
GROSS EVAPORATION IN MILLIMETRES

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1912	2.1	1.3	1.8	2.2	38.6	134.6	114.6	126.8	105.1	62.6	3.0	2.1	594.8
1913	.7	2.1	5.2	0.0	57.7	116.7	143.7	141.2	113.2	57.1	4.1	3.3	649.0
1914	1.5	.8	4.8	12.5	43.7	139.2	207.0	175.2	181.9	60.6	11.7	2.7	881.6
1915	2.1	4.4	9.6	0.0	46.8	139.7	121.3	165.7	112.2	68.6	3.3	2.5	676.2
1916	.9	1.3	2.2	22.2	42.9	68.6	122.2	124.4	114.0	73.3	9.7	3.9	605.1
1917	1.6	1.5	4.2	18.6	52.9	125.6	179.3	123.7	109.9	77.5	19.8	.6	715.0
1918	1.0	1.6	5.6	20.0	63.8	120.5	159.9	171.2	132.1	77.7	6.6	2.0	762.0
1919	2.2	.9	1.5	3.5	88.9	175.2	177.2	161.0	125.0	54.6	1.9	1.4	793.3
1920	.9	1.9	2.4	22.8	31.1	97.9	111.3	120.5	108.0	68.5	4.3	1.7	571.3
1921	5.1	4.9	9.3	27.5	38.7	98.7	129.0	130.2	106.4	73.6	5.2	4.4	633.0
1922	3.8	2.6	7.8	9.4	51.0	147.4	169.5	113.2	95.7	69.2	10.2	3.0	682.8
1923	3.9	5.9	8.3	21.8	30.0	69.4	115.8	137.6	94.7	73.6	16.3	9.5	607.0
1924	3.8	7.8	7.7	21.4	49.2	109.2	152.9	146.0	135.0	77.4	8.8	2.5	721.7
1925	3.5	4.0	9.5	16.5	57.0	108.2	151.6	148.5	103.6	71.6	11.6	4.8	690.2
1926	6.8	7.2	16.9	26.7	40.6	130.8	144.1	133.7	112.5	70.5	6.0	4.0	699.8
1927	3.6	4.0	11.1	29.1	29.8	90.2	113.2	127.7	114.2	66.3	5.1	2.3	601.6
1928	6.0	8.5	14.5	24.5	55.6	89.4	121.2	136.8	120.2	80.0	10.0	4.8	671.5
1929	.8	2.6	9.5	22.1	19.0	86.8	165.5	177.6	116.5	68.1	8.3	2.7	679.5
1930	1.4	4.7	9.0	22.8	71.0	105.4	117.7	146.4	126.5	84.4	12.4	6.4	684.1
1931	4.3	9.7	10.2	22.2	32.8	90.2	121.9	141.1	97.6	70.8	10.6	5.4	616.8
1932	3.3	4.3	4.4	27.3	37.0	74.0	122.8	134.2	135.4	75.2	6.7	4.5	629.1
1933	3.3	5.1	8.5	22.3	42.0	115.5	183.5	171.5	127.6	76.6	15.0	3.4	774.5
1934	8.7	13.3	25.5	36.8	80.0	124.0	152.3	156.7	108.2	71.3	14.4	5.7	794.9
1935	2.0	5.7	8.2	38.7	49.7	65.4	123.4	155.8	124.2	74.3	4.4	4.4	656.2
1936	1.9	1.1	10.3	27.0	31.9	126.5	189.9	166.8	124.9	86.6	17.3	4.6	788.8
1937	1.4	4.2	9.5	31.9	57.9	150.4	178.8	160.7	115.4	68.2	7.3	4.0	789.7
1938	4.9	3.3	15.2	30.9	31.5	100.6	144.4	148.2	107.0	71.9	7.9	6.5	672.3
1939	4.9	2.5	7.4	36.8	36.8	91.6	153.2	134.6	135.1	86.9	18.0	9.4	717.4
1940	4.6	5.7	11.0	36.0	39.5	112.8	118.4	177.6	110.0	75.8	8.4	4.6	704.4
1941	6.1	6.4	13.0	22.5	47.3	120.6	170.9	151.7	118.6	67.3	10.6	4.7	739.9
1942	1.2	1.2	17.6	14.9	60.4	91.5	107.2	124.9	107.5	84.5	5.6	2.8	619.3
1943	1.6	5.3	5.2	31.7	68.7	87.6	127.0	167.0	147.0	84.2	12.6	8.4	746.3
1944	4.8	2.0	5.9	23.4	61.3	127.5	134.0	147.2	122.6	85.0	5.0	5.6	724.3
1945	4.0	5.9	21.4	46.3	52.9	77.7	133.7	154.6	132.6	72.0	4.7	5.0	710.8
1946	2.7	5.7	22.2	20.5	53.7	111.8	136.0	161.8	120.1	70.6	8.1	3.5	716.7
1947	3.5	1.9	8.4	30.9	52.6	99.8	170.1	148.1	128.6	83.4	6.9	3.1	737.3
1948	4.2	2.5	4.6	37.2	44.8	119.4	172.7	177.8	162.2	104.9	12.7	2.2	845.2
1949	2.6	1.2	7.5	31.3	76.6	140.1	149.1	159.6	141.3	84.4	16.8	2.0	814.5
1950	.5	1.9	7.1	35.7	45.5	90.8	111.2	134.6	121.0	70.7	4.7	1.9	625.6
1951	1.2	2.3	4.4	27.7	35.7	104.5	100.1	134.6	113.7	64.1	6.6	1.3	596.2
1952	.9	3.6	5.7	6.0	65.9	128.3	122.2	141.8	114.3	92.4	16.9	3.3	701.3
1953	3.9	5.5	7.8	35.9	38.8	81.7	127.5	152.4	138.1	101.3	21.2	9.2	723.3
1954	3.6	11.5	10.7	46.0	37.6	66.4	106.6	118.0	114.4	82.2	20.3	13.6	630.9
1955	7.3	6.8	8.7	24.1	57.7	109.7	116.7	163.2	145.9	89.7	8.3	6.0	744.1
1956	5.5	6.8	10.0	39.2	50.9	115.0	127.4	149.9	139.0	91.6	21.0	9.3	765.6
1957	6.3	10.2	16.9	36.4	56.0	114.0	161.2	146.5	130.6	76.2	14.4	9.9	778.6
1958	9.7	8.4	15.0	26.9	83.7	155.1	162.5	190.8	164.9	98.4	14.7	9.3	939.4
1959	6.1	8.3	24.1	47.6	75.4	121.6	199.7	163.3	156.8	73.5	16.6	11.4	904.4
1960	4.0	7.8	11.6	37.9	62.2	130.7	148.5	162.8	146.9	91.8	16.3	8.6	829.1
1961	8.8	9.5	15.2	38.2	66.2	151.5	189.6	205.2	162.3	84.6	14.2	5.6	950.9
1962	7.7	4.4	7.2	23.6	57.7	120.9	140.7	133.8	134.0	94.6	16.1	7.2	747.9
1963	5.5	6.4	12.1	34.9	59.0	110.6	142.2	135.3	127.5	110.5	16.2	9.2	769.4
1964	7.4	9.1	6.9	37.4	81.5	149.8	182.7	197.8	129.8	83.4	15.9	4.5	904.2
1965	4.4	6.5	7.4	32.6	77.3	111.0	149.7	173.3	129.3	102.6	9.5	7.6	811.2
1966	3.2	5.4	12.1	47.4	85.0	109.0	131.4	168.3	159.7	108.9	9.6	6.7	846.7
1967	5.9	5.9	8.0	36.5	74.0	118.5	167.8	185.8	192.4	100.7	16.3	7.7	919.5
1968	5.3	7.9	22.0	54.6	85.5	154.5	167.4	156.6	128.2	88.0	17.9	5.3	893.2
1969	1.5	6.1	9.7	29.0	76.0	144.6	149.6	219.2	150.7	76.7	21.2	9.7	894.0
1970	5.0	11.4	8.2	35.5	79.3	136.5	156.3	206.5	159.1	91.5	8.6	4.0	901.7
1971	3.6	7.3	8.0	39.1	97.3	146.3	159.9	203.8	155.5	98.0	11.0	5.1	934.9
1972	4.0	4.7	9.6	46.0	84.5	190.9	159.9	169.1	153.1	94.2	11.2	6.2	913.4
1973	7.8	8.8	23.8	37.1	67.1	141.8	181.9	183.7	153.1	96.8	7.5	4.1	913.5
1974	3.5	7.9	7.9	29.7	52.7	108.0	155.4	169.8	142.4	105.6	20.8	10.8	814.5
1975	5.0	6.8	9.8	41.1	57.0	100.8	144.8	165.9	151.0	84.9	18.1	7.6	792.8
1976	8.5	12.2	12.5	33.4	114.4	141.5	146.8	182.2	154.9	93.9	25.0	7.5	932.4
1977	5.8	12.9	23.7	50.9	81.2	186.2	184.1	168.2	116.7	107.5	19.6	6.4	963.2
1978	5.6	10.1	24.1	45.7	86.2	166.2	198.0	193.4	149.6	120.0	18.0	11.4	1028.3
1979	5.8	4.2	11.4	41.6	55.5	84.9	141.9	182.4	163.3	92.1	10.2	9.3	802.6
1980	6.5	9.3	11.5	46.8	116.1	175.3	172.2	149.7	130.7	97.7	20.1	7.3	945.2
MEAN	4.1	5.6	10.6	29.5	58.7	118.7	148.0	157.3	130.8	82.2	11.9	5.5	762.9
MAX	9.7	13.3	24.1	54.6	116.1	190.9	207.0	219.2	192.4	120.0	25.0	13.6	1028.3
MIN	.4	.8	1.5	0.0	19.0	65.4	100.1	113.2	94.7	54.6	1.9	.8	571.3

NOTE: Gross evaporation data shown in this table were computed by P.F.R.A. (1982) using the Meyer formula. The data correspond with the North Battleford meteorological station but are considered representative of gross evaporation in the effective basin of Eyehill Creek.

TABLE B-3
EFFECTIVE DRAINAGE BASIN OF EYEHILL CREEK
NET EVAPORATION IN MILLIMETRES

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1912	1.6	1.1	-3.3	1.4	8.9	104.7	-21.5	57.2	52.8	48.7	-7.1	-10.6	234.1
1913	-12.0	-2.9	-2.4	0.0	46.0	73.5	53.3	74.1	86.0	52.5	5.5	3.1	376.7
1914	-16.5	-9.4	-15.5	-1.2	11.0	76.4	174.5	116.8	81.1	3.2	-7.1	-18.1	395.4
1915	2.1	1.4	9.6	-17.3	5.9	104.4	40.5	180.2	95.2	60.5	-4.3	-2.6	455.6
1916	-18.9	.8	-25.2	3.7	-27.4	-4.3	68.6	5.0	87.4	55.3	9.4	-1.7	154.7
1917	-25.9	-3.6	-3.4	-12.6	43.7	106.3	159.2	75.9	96.5	73.0	15.1	-17.5	506.7
1918	-37.3	-6.8	-31.0	-3.4	37.7	94.8	129.0	149.3	126.0	66.3	3.6	-14.0	514.2
1919	-16.6	-6.7	-13.0	-2.6	70.2	141.6	170.1	97.7	78.3	34.8	-12.9	-8.3	532.6
1920	-35.7	-7.5	-15.4	-1.6	-32.7	16.1	10.2	49.6	71.6	22.1	-1.3	-3.4	72.2
1921	-15.2	-31.8	-6.9	-73.8	-5.0	52.7	32.5	110.6	35.3	64.7	-16.2	-.6	146.5
1922	-1.3	-5.0	-8.7	-5.9	-10.0	138.3	149.7	65.4	84.8	39.7	10.0	-8.2	448.8
1923	-10.1	3.4	1.7	19.8	17.0	-55.4	12.9	66.4	79.5	65.5	14.3	3.9	218.9
1924	-6.9	-9.0	4.4	12.5	6.8	107.4	114.3	72.8	112.4	67.0	-14.5	-10.7	456.5
1925	-9.0	-11.3	-3.2	-29.2	53.7	-1.8	118.6	126.9	80.5	46.7	9.1	2.3	383.3
1926	.8	-6.2	12.3	10.5	-19.1	106.7	124.8	93.8	84.3	59.3	-14.4	-7.9	444.9
1927	1.5	.2	3.5	2.7	-58.8	31.0	-30.6	108.4	68.9	49.5	-5.5	-1.2	169.6
1928	3.5	5.0	-1.5	7.7	28.2	15.2	74.0	112.4	117.9	65.0	9.7	-.8	436.3
1929	-7.0	-8.1	6.5	9.4	-12.7	78.7	152.0	159.1	104.3	65.8	-6.4	-21.7	519.9
1930	-6.8	-11.5	.8	-20.9	40.0	-24.6	25.2	132.4	23.1	27.6	9.1	2.6	197.0
1931	4.0	8.9	3.8	21.7	20.4	42.4	37.8	120.0	48.1	66.5	-6.4	-16.2	351.0
1932	-37.8	3.8	.3	-65.2	10.8	-6.8	70.5	100.7	86.7	62.5	-1.7	-8.7	217.1
1933	-6.9	-6.6	-24.8	-.3	-8.5	88.6	169.8	164.9	77.8	43.1	-6.3	-34.7	456.1
1934	-.2	6.7	15.4	7.1	70.3	67.4	125.6	118.8	79.7	70.8	3.2	-35.4	529.4
1935	-19.6	2.4	-2.7	13.1	22.0	-19.9	82.0	132.2	109.2	52.7	-26.6	-3.7	341.1
1936	-10.0	-8.0	8.8	18.6	10.6	93.0	169.8	125.4	100.5	76.7	16.3	-34.0	567.7
1937	-14.1	-9.5	9.2	21.2	11.4	130.6	137.6	110.9	68.9	28.1	-12.7	-10.9	470.7
1938	-10.6	-19.1	-2.6	20.5	-41.9	53.1	101.0	108.1	94.8	23.1	-28.7	-18.9	278.8
1939	-10.5	-11.3	.8	21.6	6.8	-24.5	121.2	112.4	115.3	67.8	6.8	-21.1	385.1
1940	.5	-8.5	5.4	8.1	-15.4	24.1	77.0	169.7	87.9	18.6	-19.8	-6.6	341.0
1941	-8.3	-3.5	7.4	11.3	9.7	87.8	111.2	77.0	90.1	59.2	1.7	-1.4	442.2
1942	-4.6	.9	10.5	-21.9	34.0	20.6	29.5	95.4	75.5	75.9	-11.4	-16.5	287.9
1943	-17.5	-11.5	-27.8	24.8	-51.4	25.9	99.6	82.2	127.9	41.3	1.4	5.4	300.3
1944	-6.6	-14.5	-11.4	8.4	16.9	9.4	-.4	21.5	92.9	83.3	-7.0	-.8	191.7
1945	-28.2	-14.4	18.9	23.4	38.2	41.6	76.8	99.5	92.5	65.9	-7.2	-2.6	404.4
1946	-12.8	-23.5	17.1	6.5	32.1	11.7	108.6	81.3	70.3	24.6	-17.8	-13.8	284.3
1947	-6.7	-13.3	-1.8	15.7	38.4	54.8	147.5	114.1	56.2	58.5	-5.0	-27.4	411.0
1948	-7.2	-49.1	-.2	-13.9	20.9	100.6	137.1	160.8	155.6	97.8	-11.4	-25.2	565.8
1949	-27.6	-12.3	-6.7	10.5	21.5	115.5	83.1	144.9	113.4	69.2	-6.3	-28.5	476.7
1950	-21.9	-.4	7.1	22.7	25.7	35.9	-11.5	87.9	107.3	9.2	4.7	-5.2	261.5
1951	-9.5	.8	-26.1	10.4	5.5	63.1	-17.0	75.2	102.8	38.2	4.8	-7.3	240.9
1952	-13.5	2.1	-24.8	5.2	35.4	48.3	27.7	114.9	100.1	86.8	15.4	3.3	401.1
1953	1.1	5.5	-27.5	3.4	13.4	55.0	4.1	117.3	129.0	101.0	18.7	-6.8	414.2
1954	-18.5	5.1	5.1	35.1	-22.8	26.0	41.6	-52.2	71.0	80.4	14.5	11.8	197.1
1955	-5.4	5.5	-9.1	-38.6	39.4	58.6	71.0	152.8	107.3	78.0	-1.6	-56.2	401.7
1956	-3.4	-20.4	-17.9	36.7	45.3	-64.8	106.6	128.1	111.6	88.8	16.4	-29.6	397.4
1957	-2.6	7.7	-17.9	29.5	48.1	85.8	116.2	17.2	109.3	55.1	4.7	-.3	452.8
1958	-8.1	-5.1	-4.0	22.6	37.7	134.8	129.5	173.5	123.0	97.9	-13.7	-12.3	675.8
1959	-1.5	-4.4	21.6	34.9	56.9	62.9	169.5	95.0	95.6	25.0	6.4	8.9	570.8
1960	-1.1	-6.2	-1.1	24.9	36.8	102.8	106.4	31.7	140.0	84.4	8.7	-2.8	524.5
1961	-2.6	-18.4	-.5	21.2	26.3	38.5	131.2	201.1	149.8	43.2	-2.8	-7.1	579.9
1962	-22.6	-32.4	-18.2	9.1	43.7	55.6	7.6	67.5	90.1	90.8	-9.8	-10.6	270.6
1963	-27.6	-24.1	-10.8	-36.2	9.5	-24.0	57.4	60.6	107.9	105.4	-5.1	-8.3	204.5
1964	-20.0	-17.6	3.1	17.1	12.4	97.7	110.6	153.3	30.2	64.9	5.0	-36.4	420.3
1965	-31.4	-35.4	4.1	28.8	26.0	-102.1	118.2	118.7	106.4	102.6	-4.0	-8.7	323.2
1966	-26.5	-5.8	-18.4	41.8	66.7	44.7	42.5	89.3	157.7	103.3	-30.8	-1.2	463.3
1967	-6.8	-14.4	-30.1	13.6	66.4	43.3	100.7	165.2	192.4	73.3	-11.4	-21.0	571.2
1968	-15.8	-1.2	10.6	44.4	27.1	109.3	77.7	74.8	30.9	64.4	14.8	-18.8	419.0
1969	-56.9	-14.2	-.5	5.6	43.7	130.6	80.0	204.5	91.0	57.9	6.0	-10.6	537.1
1970	-6.4	1.2	-17.2	35.3	71.4	8.7	81.1	191.3	159.1	40.5	-14.3	-29.0	521.7
1971	-42.1	-2.9	-8.5	28.9	90.2	63.2	40.5	89.2	144.3	84.8	-16.9	-25.4	445.3
1972	-31.6	-27.0	2.5	40.9	54.6	150.8	65.7	139.6	122.9	89.6	-3.3	-5.5	599.2
1973	4.0	-3.4	6.8	6.1	46.8	49.1	117.4	77.5	136.3	84.9	-18.9	-18.3	488.3
1974	-55.9	-5.3	-43.4	3.3	13.6	35.4	75.9	118.2	119.0	102.8	20.8	-.9	403.5
1975	-18.9	-17.6	-11.8	-22.6	-9.8	24.6	81.3	109.3	145.9	48.6	10.0	-24.7	314.3
1976	-3.9	0.0	-13.7	10.3	94.3	52.4	23.4	130.1	140.2	91.1	23.2	-21.7	525.7
1977	-17.6	10.4	21.1	32.6	-36.5	169.7	148.5	129.0	51.2	106.7	14.8	-9.9	619.8
1978	-5.8	2.5	17.8	-34.7	15.2	136.0	138.1	136.5	99.0	101.2	-21.3	-6.5	578.0
1979	-2.9	-28.4	-7.0	25.6	19.5	-5.9	65.4	116.0	147.7	81.5	7.8	-2.5	416.8
1980	-17.5	-4.2	-24.5	39.8	90.9	84.3	88.6	96.5	106.5	73.7	15.1	-14.2	535.0
MEAN	-13.1	-7.8	-4.4	7.7	22.4	55.5	84.6	107.0	99.1	63.9	-1.2	-11.5	402.0
MAX	4.0	10.4	21.6	44.4	94.3	169.7	174.5	204.5	192.4	106.7	23.2	11.8	675.8
MIN	-56.9	-49.1	-43.4	-73.8	-58.8	-102.1	-30.6	-52.2	23.1	3.2	-30.8	-56.2	72.2

Shaded area denotes net evaporation computed using precipitation recorded at North Battleford.

Shaded area denotes net evaporation computed using precipitation recorded at Provost.

Unshaded area denotes net evaporation computed using precipitation recorded at Macklin.

APPENDIX C

WATER USE DATA

TABLE C-1

EFFECTIVE DRAINAGE BASIN OF EYEHILL CREEK
WATER USE PROJECTS

Project Number	Land Location	Province	Project Status[1]	File Number	Period of Operation	Purpose[1]	Unregulated Effective Drainage[2] Area, Km^2	Reservoir Volume At F.S.L. dam^3	Reservoir Area At F.S.L. ha	Authorized Annual Depletion[3] dam^3
1	NE 03-37-03-W4	Alta.	Unautn.		1960-1980	S.W.	0.2	4.9	0.4	
2	SW 14-37-03-W4	Alta.	Lic.	4310	1973-1980	S.W.	1.3	1.2	0.4	1.2
3	SW 12-37-03-W4	Alta.	Unauth.		1967-1980	S.W.	7.2	8.6	0.8	
4	SE 12-37-03-W4	Alta.	Unauth.		1967-1980	S.W.	1.3	2.5	0.2	
5	NE 06-37-02-W4	Alta.	Unauth.		1960-1980	S.W.	13.3	2.5	0.2	
6	NW 05-37-02-W4	Alta.	Unauth.		1967-1980	S.W.	1.3	4.9	0.4	
7	SE 05-37-02-W4	Alta.	Unauth.		1960-1980	S.W.	0.7	2.5	0.2	
8	SE 05-37-02-W4	Alta.	Unauth.		1967-1980	S.W.	0.7	4.9	0.4	
9	SE 03-37-01-W4	Alta.	Lic.	6590	1944-1980	S.W.	2.3	14.8	2.0	12.3
10	SW 09-37-01-W4	Alta.	Auth.	14210	1966-1980	W.P.	8.9	110	8.9	98.7
11	NE 35-37-01-W4	Alta.	Auth.	13929	1978-1980	W.P.	83.2	36	6.5	29.6
12	SE 32-37-28-W3	Sask.	Unauth.		1960-1980	S.W.	0.9	0.5	0.1	
13	NW 32-37-28-W3	Sask.	Unauth.		1960-1980	S.W.	0.3	1.4	0.2	
14	SE 16-38-28-W3	Sask.	Lic.	837	1937-1980	S.W.	2.3	4.4	0.5	2.0
15	NE 16-38-28-W3	Sask.	Unauth.	52470	1965-1967	S.W.	0.9	4.9	0.4	
16	SE 03-39-28-W3	Sask.	Lic.	50261	1914-1958	Ind.	5.3	1060	73.6	358
17	NE 33-38-28-W3	Sask.	Auth.	1283	1939-1975	S.W.	59.0	2770	205	0.0
17	NE 33-38-28-W3	Sask.	Auth.	1283	1976-1980	S.W.,Rec.	59.0	4420	246	0.0

NOTES:

1. Abbreviations used in the "Project Status" and "Purpose" columns are as follows:
   Lic. - Licensed; Auth. - Authorized; Unauth. - Unauthorized
   S.W. - Stock Watering; W.P. - Wildlife Preservation; Ind. - Industrial; Rec. - Recreation

2. Unregulated effective drainage area is the effective drainage area between the specified project and any projects upstream.

3. Depletion is the reduction in streamflow at the project and includes water withdrawal for human or livestock use, evaporation losses, and change in storage.

TABLE C - 2
EYEHILL CREEK NEAR MACKLIN - STATION NO. 05GA007
NET DEPLETION OF UPSTREAM PROJECTS IN CUBIC METRES PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN FOR MAR-OCT	VOLUME DAM^3
1912	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1913	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1914	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1915	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1916	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1917	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1918	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1919	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1920	-	-	-	-	.00	.00	.00	.00	.00	.00	-	-	-	-
1921	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1922	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1923	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1924	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1925	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1926	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1927	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1928	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1929	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1930	-	-	-	.00	.00	.00	.00	.00	.00	.00	-	-	-	-
1931	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1932	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1933	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1934	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1935	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1936	-	-	.00	.00	.00	.00	-	-	-	-	-	-	-	-
1937	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1938	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1939	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1940	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1941	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1942	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1943	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1944	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1945	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1946	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1947	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1948	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1949	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1950	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1951	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1959	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1960	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1961	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1965	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1967	-	-	.00	.33	-.23	-.07	.00	.00	.00	.00	-	-	.00	42.
1968	-	-	.15	.02	.00	.00	.00	.00	.00	.00	-	-	.02	450.
1969	-	-	.00	.29	-.10	-.06	.01	.00	.02	.00	-	-	.02	420.
1970	-	-	.00	.18	-.01	-.06	-.02	.00	.01	.00	-	-	.01	280.
1971	-	-	.00	.12	.29	-.08	-.01	-.11	.00	.00	-	-	.03	570.
1972	-	-	.00	.07	.00	.00	.01	.01	.02	.02	-	-	.02	330.
1973	-	-	.02	.07	.01	.41	-.22	.00	.00	.02	-	-	.04	760.
1974	-	-	.00	.22	-.03	-.05	.00	.00	-.01	.04	-	-	.02	400.
1975	-	-	.00	.21	-.42	-.13	-.01	.00	.08	.01	-	-	-.03	-700.
1976	-	-	.08	-.09	.02	.01	.02	.00	.00	.00	-	-	.01	130.
1977	-	-	.00	.03	.32	.00	-.01	.00	.00	.00	-	-	.04	890.
1978	-	-	.20	.14	.00	.01	-.02	.00	.00	.00	-	-	.04	890.
1979	-	-	.43	-.47	-.02	.00	.00	.00	.00	.00	-	-	-.01	-120.
1980	-	-	.01	.06	.00	.00	.00	.00	.00	.00	-	-	.01	180.

NOTE: NET DEPLETION COMPUTED ONLY FOR PERIODS OF STREAMFLOW RECORD ON EYEHILL CREEK.

TABLE C - 3
EYEHILL CREEK AT ALBERTA-SASKATCHEWAN BOUNDARY
NET DEPLETION OF UPSTREAM PROJECTS IN CUBIC METRES PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN FOR MAR-OCT	VOLUME DAM3
1912	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1913	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1914	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1915	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1916	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1917	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1918	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1919	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1920	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1921	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1922	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1923	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1924	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1925	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1926	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1927	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1928	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1929	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1930	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1931	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1932	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1933	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1934	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1935	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1936	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1937	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1938	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1939	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1940	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1941	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1942	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1943	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	.00
1944	-	-	.00	.01	.00	.00	.00	.00	.00	.00	-	-	.00	21.
1945	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	11.
1946	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	9.0
1947	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	11.
1948	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	5.0
1949	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	16.
1950	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	10.
1951	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	7.6
1952	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	10.
1953	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	10.
1954	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	5.5
1955	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	3.7
1956	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	18.
1957	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	6.3
1958	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	7.8
1959	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	4.8
1960	-	-	.01	.00	.00	.00	.00	.00	.00	.00	-	-	.00	20.
1961	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	8.0
1962	-	-	.00	.00	.00	.00	.01	.00	.00	.00	-	-	.00	29.
1963	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	15.
1964	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	8.2
1965	-	-	.00	.01	.00	.00	.00	.00	.00	.00	-	-	.00	27.
1966	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	45.
1967	-	-	.00	.03	.02	.00	.00	.00	.00	.00	-	-	.01	150.
1968	-	-	.02	.00	.00	.00	.00	.00	.01	.01	-	-	.01	120.
1969	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	34.
1970	-	-	.00	.02	.00	.00	.00	.02	.00	.00	-	-	.01	130.
1971	-	-	.00	.01	.01	.00	.00	.01	.00	.00	-	-	.00	89.
1972	-	-	.01	.00	.00	.00	.00	.00	.02	.01	-	-	.00	100.
1973	-	-	.00	.00	.00	.01	.01	.00	.01	.00	-	-	.00	79.
1974	-	-	.00	.01	.00	.00	.00	.01	.00	.01	-	-	.00	65.
1975	-	-	.00	.01	.00	.00	.00	.00	.01	.00	-	-	.00	83.
1976	-	-	.01	.00	.01	.00	.00	.00	.01	.01	-	-	.00	75.
1977	-	-	.00	.00	.01	.00	.00	.00	.00	.00	-	-	.00	28.
1978	-	-	.03	.01	.00	.00	.00	.00	.00	.00	-	-	.01	120.
1979	-	-	.04	.00	.00	.00	.00	.00	.00	.00	-	-	.01	110.
1980	-	-	.01	.03	.01	.00	.00	.00	.00	.00	-	-	.01	110.

TABLE C - 4
EYEHILL CREEK AT ALBERTA-SASKATCHEWAN BOUNDARY
NET DEPLETION OF UPSTREAM PROJECTS FOR PRESENT LEVEL OF DEVELOPMENT
IN CUBIC METRES PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN FOR MAR-OCT	VOLUME DAM^3
1912	-	-	.00	.00	.03	.01	.00	.01	.01	.01	-	-	.01	140.
1913	-	-	.00	.00	.01	.00	.01	.01	.01	.01	-	-	.00	95.
1914	-	-	.00	.00	.00	.01	.01	.01	.01	.00	-	-	.01	110.
1915	-	-	.00	.00	.00	.01	.00	.01	.01	.01	-	-	.00	100.
1916	-	-	.00	.00	.00	.00	.01	.00	.01	.01	-	-	.00	62.
1917	-	-	.00	.00	.00	.01	.01	.01	.01	.01	-	-	.01	110.
1918	-	-	.00	.00	.00	.00	.00	.01	.01	.01	-	-	.00	100.
1919	-	-	.00	.01	.01	.01	.01	.01	.01	.01	-	-	.01	160.
1920	-	-	.00	.00	.00	.00	.00	.01	.01	.00	-	-	.00	45.
1921	-	-	.00	-.01	.00	.01	.00	.01	.00	.01	-	-	.00	61.
1922	-	-	.00	.00	.00	.01	.01	.01	.01	.00	-	-	.01	110.
1923	-	-	.00	.00	.00	.00	.00	.01	.01	.01	-	-	.00	59.
1924	-	-	.00	.00	.00	.01	.01	.01	.01	.01	-	-	.01	120.
1925	-	-	.00	.00	.01	.00	.01	.01	.01	.01	-	-	.00	95.
1926	-	-	.00	.00	.00	.01	.01	.01	.01	.01	-	-	.01	110.
1927	-	-	.00	.00	.00	.00	.00	.01	.01	.01	-	-	.00	56.
1928	-	-	.00	.00	.00	.00	.01	.01	.01	.01	-	-	.00	100.
1929	-	-	.00	.00	.00	.01	.01	.01	.01	.01	-	-	.01	110.
1930	-	-	.01	.00	.00	.00	.00	.01	.00	.00	-	-	.00	71.
1931	-	-	.00	.00	.00	.00	.00	.01	.01	.01	-	-	.00	89.
1932	-	-	.00	-.01	.00	.00	.00	.01	.01	.01	-	-	.00	67.
1933	-	-	.00	.00	.00	.01	.01	.01	.01	.01	-	-	.01	110.
1934	-	-	.00	.00	.01	.00	.00	.01	.01	.01	-	-	.01	110.
1935	-	-	.00	.01	.00	.00	.00	.01	.01	.01	-	-	.00	91.
1936	-	-	.00	.01	.00	.01	.01	.01	.01	.01	-	-	.01	130.
1937	-	-	.00	.01	.00	.00	.00	.02	.01	.01	-	-	.01	110.
1938	-	-	.00	.00	.00	.01	.01	.01	.01	.00	-	-	.00	100.
1939	-	-	.00	.00	.00	.00	.01	.01	.01	.01	-	-	.00	100.
1940	-	-	.00	.00	.00	.00	.01	.01	.01	.01	-	-	.00	82.
1941	-	-	.00	.00	.00	.01	.01	.01	.01	.01	-	-	.01	120.
1942	-	-	.00	.00	.00	.00	.00	.01	.01	.01	-	-	.00	79.
1943	-	-	.00	.00	.00	.00	.01	.01	.01	.01	-	-	.00	87.
1944	-	-	.00	.00	.00	.00	.00	.00	.01	.01	-	-	.00	64.
1945	-	-	.00	.00	.00	.00	.01	.01	.01	.01	-	-	.00	100.
1946	-	-	.00	.00	.00	.00	.01	.01	.01	.00	-	-	.00	85.
1947	-	-	.00	.00	.00	.00	.01	.01	.01	.01	-	-	.01	110.
1948	-	-	.00	.00	.00	.00	.00	.01	.01	.01	-	-	.00	89.
1949	-	-	.01	.01	.00	.01	.01	.01	.01	.01	-	-	.01	150.
1950	-	-	.00	.01	.00	.00	.00	.01	.01	.00	-	-	.00	90.
1951	-	-	.00	.00	.00	.01	.00	.01	.01	.00	-	-	.00	73.
1952	-	-	.00	.00	.00	.01	.00	.01	.01	.01	-	-	.00	100.
1953	-	-	.00	.00	.00	.01	.00	.01	.01	.01	-	-	.00	100.
1954	-	-	.00	.00	.00	.00	.00	.00	.01	.01	-	-	.00	53.
1955	-	-	.00	.00	.00	.01	.00	.01	.00	.01	-	-	.00	63.
1956	-	-	.00	.02	.01	.00	.01	.01	.01	.01	-	-	.01	150.
1957	-	-	.00	.00	.01	.01	.00	.01	.01	.00	-	-	.00	86.
1958	-	-	.00	.01	.00	.01	.01	.01	.00	.00	-	-	.00	100.
1959	-	-	.01	.00	.00	.00	.00	.00	.00	.00	-	-	.00	69.
1960	-	-	.02	.00	.00	.00	.00	.00	.00	.00	-	-	.00	95.
1961	-	-	.01	.00	.00	.00	.00	.00	.00	.00	-	-	.00	59.
1962	-	-	.00	.02	.00	.00	.03	.01	.01	.00	-	-	.01	180.
1963	-	-	.01	.00	.00	.00	.01	.00	.00	.00	-	-	.00	53.
1964	-	-	.00	.00	.01	.00	.00	.00	.00	.00	-	-	.00	50.
1965	-	-	.00	.03	.00	-.01	.01	.00	.00	.01	-	-	.01	140.
1966	-	-	.01	.01	.00	.00	.00	.01	.00	.01	-	-	.00	94.
1967	-	-	.00	.02	.01	.01	.01	.00	.00	.00	-	-	.00	96.
1968	-	-	.03	.00	.00	.00	.00	.00	.01	.01	-	-	.01	170.
1969	-	-	.00	.00	.00	.00	.00	.00	.01	.00	-	-	.00	63.
1970	-	-	.00	.03	.01	.00	.00	.02	.01	.00	-	-	.01	170.
1971	-	-	.00	.01	.01	.00	.00	.02	.01	.01	-	-	.01	130.
1972	-	-	.01	.00	.00	.01	.00	.00	.02	.01	-	-	.01	150.
1973	-	-	.00	.00	.00	.01	.01	.00	.01	.01	-	-	.01	110.
1974	-	-	.00	.01	.00	.00	.00	.01	.00	.01	-	-	.00	91.
1975	-	-	.00	.01	.00	.00	.01	.01	.01	.00	-	-	.01	110.
1976	-	-	.01	.00	.01	.01	.00	.00	.01	.01	-	-	.01	110.
1977	-	-	.00	.00	.01	.00	.00	.00	.00	.00	-	-	.00	28.
1978	-	-	.03	.01	.00	.00	.00	.00	.00	.00	-	-	.00	100.
1979	-	-	.04	.00	.00	.00	.00	.00	.00	.00	-	-	.01	110.
1980	-	-	.01	.03	.01	.00	.00	.00	.00	.00	-	-	.01	110.
MEAN	-	-	.00	.00	.00	.00	.01	.01	.01	.01	-	-	.00	98.
MAX	-	-	.04	.03	.03	.01	.03	.02	.02	.01	-	-	.01	180.
MIN	-	-	.00	-.01	.00	-.01	.00	.00	.00	.00	-	-	.00	28.

APPENDIX D

NATURAL FLOWS

TABLE D-1
MONITOR CREEK NEAR MONITOR - STATION NO. 05GA003
COMPUTED NATURAL FLOW IN CUBIC METRES PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN FOR MAR-OCT	VOLUME DAM^3
1912	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1913	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1914	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1915	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1916	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1917	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1918	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1919	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1920	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1921	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1922	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1923	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1924	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1925	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1926	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1927	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1928	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1929	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1930	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1931	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1932	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1933	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1934	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1935	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1936	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1937	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1938	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1939	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1940	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1941	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1942	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1943	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1944	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1945	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1946	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1947	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1948	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1949	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1950	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1951	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	.00	.29	.07	.05	.01	.08	.19	.03	-	-	.09	1900.
1955	-	-	.15	.36	.19	.03	.00	.01	.00	.01	-	-	.09	2000.
1956	-	-	.00	4.7	.59	.09	.21	.06	.08	.05	-	-	.72	15100.
1957	-	-	.18	.25	.05	.01	.00	.02	.03	.02	-	-	.07	1500.
1958	-	-	.00	2.1	.06	.02	.01	.02	.00	.00	-	-	.27	5700.
1959	-	-	.13	.02	.01	.00	.00	.00	.00	.00	-	-	.02	450.
1960	-	-	.32	.03	.00	.00	.00	.00	.00	.00	-	-	.05	940.
1961	-	-	.02	.02	.00	.00	.00	.00	.00	.00	-	-	.01	120.
1962	-	-	.00	.32	.00	.00	.69	.05	.01	.00	-	-	.14	2900.
1963	-	-	.88	.12	.02	.06	.61	.01	.00	.00	-	-	.21	4500.
1964	-	-	.00	.01	.05	.00	.00	.00	.00	.00	-	-	.01	180.
1965	-	-	.00	5.9	.23	.15	.10	.00	.00	.04	-	-	.79	16600.
1966	-	-	.09	.08	.01	.01	.00	.05	.00	.01	-	-	.03	630.
1967	-	-	.00	.92	.35	.05	.00	.00	.00	.00	-	-	.16	3400.
1968	-	-	.52	.13	.01	.00	.00	.00	.01	.00	-	-	.09	1800.
1969	-	-	.00	4.1	.12	.00	.01	.00	.04	.00	-	-	.52	11100.
1970	-	-	.00	1.6	.07	.01	.01	.00	.02	.00	-	-	.21	4400.
1971	-	-	.00	2.9	.62	.00	.00	.06	.00	.00	-	-	.44	9400.
1972	-	-	.01	.23	.01	.00	.03	.01	.03	.04	-	-	.04	920.
1973	-	-	.04	.14	.01	1.1	.05	.00	.00	.04	-	-	.17	3700.
1974	-	-	.00	4.3	1.6	.11	.00	.08	.00	.07	-	-	.76	16100.
1975	-	-	.00	.71	.63	.09	.01	.00	.16	.03	-	-	.20	4300.
1976	-	-	.16	.59	.04	.02	.05	.00	.00	.00	-	-	.11	2300.
1977	-	-	.00	.05	.61	.00	.00	.00	.00	.00	-	-	.08	1800.
1978	-	-	.39	.28	.01	.01	.00	.00	.00	.00	-	-	.09	1800.
1979	-	-	.83	.06	.04	.00	.00	.00	.00	.00	-	-	.12	2500.
1980	-	-	.01	.11	.00	.01	.00	.00	.00	.00	-	-	.02	350.
MEAN	-	-	.14	1.1	.20	.07	.07	.02	.02	.01	-	-	.20	4300.
MAX	-	-	.88	5.9	1.6	1.1	.69	.08	.19	.07	-	-	.79	16600.
MIN	-	-	.00	.01	.00	.00	.00	.00	.00	.00	-	-	.01	120.

NOTE: NATURAL FLOW COMPUTED ONLY FOR PERIOD OF STREAMFLOW RECORD ON MONITOR CREEK.

TABLE D-2
EYEHILL CREEK NEAR MACKLIN - STATION NO. 05GA007
COMPUTED AND ESTIMATED NATURAL FLOW
IN CUBIC METRES PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN FOR MAR-OCT	VOLUME DAM^3
1912	-	-	.00	.00	.24	.24	.19	.13	.11	.11	-	-	.13	2700.
1913	-	-	.00	.78	.23	.01	.04	.09	.08	.09	-	-	.16	3400.
1914	-	-	.01	.26	.30	.33	.14	.10	.12	.12	-	-	.17	3600.
1915	-	-	.02	2.0	.22	.22	.13	.05	.06	.07	-	-	.34	7200.
1916	-	-	.02	.19	.29	.30	.14	.16	.11	.11	-	-	.17	3500.
1917	-	-	.00	.44	.22	.09	.02	.06	.06	.07	-	-	.12	2500.
1918	-	-	.29	.30	.18	.01	.00	.03	.04	.06	-	-	.11	2400.
1919	-	-	.00	.14	.22	.11	.01	.08	.08	.10	-	-	.09	2000.
1920	-	-	.04	1.1	.56	.28	.17	.10	.14	.17	-	-	.32	6700.
1921	-	-	.00	2.0	.63	.22	.15	.09	.13	.11	-	-	.41	8700.
1922	-	-	.00	.50	.35	.14	.08	.07	.07	.08	-	-	.16	3400.
1923	-	-	.00	.15	.20	.17	.21	.20	.09	.11	-	-	.14	3000.
1924	-	-	.00	.07	.62	.47	.14	.07	.07	.08	-	-	.19	4000.
1925	-	-	.03	.71	.19	.18	.08	.05	.05	.08	-	-	.17	3600.
1926	-	-	.04	.38	.18	.14	.05	.06	.06	.06	-	-	.12	2600.
1927	-	-	.00	.55	.35	.33	.28	.14	.14	.33	-	-	.26	5600.
1928	-	-	.10	.97	.47	.27	.17	.07	.06	.08	-	-	.27	5800.
1929	-	-	.00	.17	.33	.13	.07	.04	.05	.08	-	-	.11	2300.
1930	-	-	.14	.24	.14	.23	.41	.08	.08	.13	-	-	.18	3800.
1931	-	-	.00	1.6	.20	.31	.16	.07	.09	.10	-	-	.31	6600.
1932	-	-	.00	.96	.25	.02	.01	.05	.07	.09	-	-	.18	3800.
1933	-	-	.01	.98	.27	.18	.05	.03	.07	.08	-	-	.21	4400.
1934	-	-	.12	1.1	.17	.00	.00	.05	.06	.08	-	-	.20	4200.
1935	-	-	.00	.60	.20	.00	.00	.03	.05	.07	-	-	.12	2600.
1936	-	-	.02	.60	.23	.09	.01	.05	.07	.08	-	-	.14	3000.
1937	-	-	.00	.50	.26	.00	.00	.06	.08	.09	-	-	.12	2600.
1938	-	-	.17	1.2	.25	.24	.10	.08	.07	.08	-	-	.27	5800.
1939	-	-	.10	.85	.18	.21	.08	.05	.06	.08	-	-	.20	4300.
1940	-	-	.00	.54	.29	.08	.03	.03	.05	.07	-	-	.13	2800.
1941	-	-	.00	1.0	.23	.26	.13	.12	.09	.10	-	-	.24	5100.
1942	-	-	.06	.00	.20	.22	.13	.07	.07	.09	-	-	.10	2200.
1943	-	-	.04	.88	.37	.18	.06	.11	.08	.10	-	-	.23	4800.
1944	-	-	.01	.77	.26	.38	.25	.20	.13	.13	-	-	.26	5600.
1945	-	-	.23	.13	.16	.05	.03	.07	.08	.09	-	-	.11	2200.
1946	-	-	.18	.38	.17	.18	.07	.11	.10	.10	-	-	.16	3400.
1947	-	-	.04	1.4	.19	.18	.05	.06	.09	.10	-	-	.25	5400.
1948	-	-	.01	1.9	.25	.00	.00	.02	.04	.06	-	-	.29	6000.
1949	-	-	.11	.14	.23	.06	.04	.03	.06	.07	-	-	.12	2500.
1950	-	-	.01	.60	.20	.02	.00	.08	.07	.08	-	-	.14	3000.
1951	-	-	.00	.96	.25	.35	.22	.12	.08	.10	-	-	.26	5400.
1952	-	-	.00	.41	.26	.17	.12	.07	.06	.08	-	-	.15	3100.
1953	-	-	.00	.00	.24	.19	.11	.08	.01	.08	-	-	.10	2100.
1954	-	-	.00	.19	.07	.05	.03	.08	.22	.03	-	-	.08	1700.
1955	-	-	.11	.23	.11	.03	.01	.01	.00	.01	-	-	.06	1400.
1956	-	-	.00	2.3	.16	.08	.27	.06	.11	.04	-	-	.38	8000.
1957	-	-	.13	.17	.06	.02	.00	.03	.05	.03	-	-	.06	1300.
1958	-	-	.00	1.1	.06	.02	.01	.02	.00	.00	-	-	.15	3300.
1959	-	-	.10	.02	.03	.00	.00	.00	.00	.00	-	-	.02	430.
1960	-	-	.23	.03	.01	.00	.00	.00	.00	.00	-	-	.04	730.
1961	-	-	.02	.01	.02	.00	.00	.00	.00	.00	-	-	.01	170.
1962	-	-	.04	.21	.01	.00	.85	.06	.03	.00	-	-	.15	3100.
1963	-	-	.57	.09	.04	.06	.75	.02	.00	.00	-	-	.19	4100.
1964	-	-	.00	.01	.06	.00	.00	.00	.00	.00	-	-	.01	220.
1965	-	-	.04	2.8	.12	.13	.13	.00	.00	.00	-	-	.40	8400.
1966	-	-	.07	.08	.02	.01	.00	.06	.00	.01	-	-	.03	630.
1967	-	-	.00	.48	.29	.09	.04	.00	.00	.00	-	-	.11	2400.
1968	-	-	.45	.07	.01	.01	.00	.00	.09	.13	-	-	.09	2000.
1969	-	-	.00	2.7	.06	.00	.01	.00	.02	.00	-	-	.34	7200.
1970	-	-	.00	.83	.04	.01	.01	.27	.04	.00	-	-	.15	3100.
1971	-	-	.00	1.9	.33	.00	.00	.23	.02	.03	-	-	.31	6500.
1972	-	-	.14	.26	.02	.01	.01	.01	.22	.06	-	-	.09	1900.
1973	-	-	.02	.07	.01	.60	.20	.00	.06	.03	-	-	.12	2600.
1974	-	-	.00	1.7	.08	.05	.00	.04	.00	.04	-	-	.24	5100.
1975	-	-	.00	.21	.30	.15	.04	.03	.09	.01	-	-	.10	2200.
1976	-	-	.08	.41	.11	.15	.10	.00	.03	.04	-	-	.11	2400.
1977	-	-	.00	.03	.32	.00	.00	.00	.00	.00	-	-	.04	940.
1978	-	-	.20	.15	.00	.01	.00	.00	.00	.00	-	-	.05	950.
1979	-	-	.43	.03	.22	.00	.00	.00	.00	.00	-	-	.09	1800.
1980	-	-	.01	.37	.14	.00	.00	.00	.00	.00	-	-	.07	1400.
MEAN	-	-	.06	.65	.20	.13	.10	.06	.06	.07	-	-	.17	3500.
MAX	-	-	.57	2.8	.63	.60	.85	.27	.22	.33	-	-	.41	8700.
MIN	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.01	170.

UNSHADED AREA DENOTES NATURAL FLOWS COMPUTED BY ADJUSTING RECORDED FLOWS FOR UPSTREAM WATER USE.

SHADED AREA DENOTES NATURAL FLOWS ESTIMATED BY PRIORITY 1 REGRESSION EQUATIONS (SEE TABLE 1 ON PAGES 16 AND 17). A PRIORITY 1 EQUATION IS THE MOST RELIABLE REGRESSION EQUATION DERIVED FOR A PARTICULAR MONTH. HOWEVER, EXTREME CARE SHOULD BE TAKEN IN USING THESE NATURAL FLOWS.

SHADED AREA DENOTES NATURAL FLOWS ESTIMATED BY PRIORITY 2 REGRESSION EQUATIONS (SEE TABLE 1 ON PAGES 16 AND 17). A PRIORITY 2 EQUATION IS THE SECOND MOST RELIABLE REGRESSION EQUATION DERIVED FOR A PARTICULAR MONTH AND IS USED WHERE DATA LIMITATIONS PROHIBIT THE USE OF PRIORITY 1 EQUATIONS. EXTREME CARE SHOULD BE TAKEN IN USING THESE NATURAL FLOWS.

TABLE D-3
EYEHILL CREEK AT ALBERTA-SASKATCHEWAN BOUNDARY
ESTIMATED NATURAL FLOW IN CUBIC METRES PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN FOR MAR-OCT	VOLUME DAM³
1912	-	-	.00	.00	.16	.17	.13	.09	.07	.08	-	-	.09	1800.
1913	-	-	.00	.53	.16	.01	.03	.06	.05	.06	-	-	.11	2400.
1914	-	-	.01	.17	.21	.22	.09	.07	.08	.08	-	-	.12	2500.
1915	-	-	.02	1.4	.15	.15	.09	.03	.04	.05	-	-	.23	4900.
1916	-	-	.01	.13	.20	.21	.10	.11	.07	.08	-	-	.11	2400.
1917	-	-	.00	.30	.15	.06	.01	.04	.04	.05	-	-	.08	1700.
1918	-	-	.20	.20	.13	.01	.00	.02	.03	.04	-	-	.08	1700.
1919	-	-	.00	.10	.15	.08	.01	.05	.06	.07	-	-	.06	1400.
1920	-	-	.03	.75	.38	.19	.12	.07	.10	.12	-	-	.22	4600.
1921	-	-	.00	1.4	.43	.15	.10	.06	.09	.08	-	-	.28	6000.
1922	-	-	.00	.34	.24	.10	.05	.05	.05	.05	-	-	.11	2300.
1923	-	-	.00	.10	.14	.12	.14	.14	.06	.08	-	-	.10	2100.
1924	-	-	.00	.05	.42	.32	.10	.05	.05	.05	-	-	.13	2800.
1925	-	-	.02	.49	.13	.12	.05	.03	.03	.05	-	-	.12	2500.
1926	-	-	.03	.26	.12	.10	.03	.04	.04	.04	-	-	.08	1700.
1927	-	-	.00	.38	.24	.23	.19	.10	.10	.23	-	-	.18	3800.
1928	-	-	.07	.66	.32	.18	.12	.05	.04	.05	-	-	.19	3900.
1929	-	-	.00	.12	.23	.09	.05	.03	.03	.05	-	-	.08	1600.
1930	-	-	.10	.16	.10	.16	.28	.05	.05	.09	-	-	.13	2600.
1931	-	-	.00	1.1	.13	.21	.12	.05	.06	.07	-	-	.21	4500.
1932	-	-	.00	.66	.17	.01	.01	.03	.05	.06	-	-	.12	2600.
1933	-	-	.00	.67	.18	.12	.04	.02	.05	.05	-	-	.14	3000.
1934	-	-	.08	.78	.11	.00	.00	.03	.04	.05	-	-	.14	2900.
1935	-	-	.00	.41	.17	.00	.00	.02	.04	.05	-	-	.09	1800.
1936	-	-	.01	.41	.16	.06	.01	.04	.04	.05	-	-	.10	2100.
1937	-	-	.00	.34	.18	.00	.00	.04	.05	.06	-	-	.08	1800.
1938	-	-	.12	.83	.17	.16	.07	.05	.05	.05	-	-	.19	4000.
1939	-	-	.07	.58	.12	.15	.06	.04	.04	.05	-	-	.14	2900.
1940	-	-	.00	.37	.20	.05	.02	.02	.04	.05	-	-	.09	1900.
1941	-	-	.00	.69	.16	.18	.09	.08	.06	.07	-	-	.16	3500.
1942	-	-	.04	.00	.13	.15	.09	.05	.05	.06	-	-	.07	1500.
1943	-	-	.03	.60	.26	.12	.04	.08	.06	.07	-	-	.16	3300.
1944	-	-	.01	.52	.18	.26	.17	.13	.09	.09	-	-	.18	3800.
1945	-	-	.16	.09	.11	.03	.02	.05	.05	.06	-	-	.07	1500.
1946	-	-	.12	.26	.12	.13	.05	.07	.07	.07	-	-	.11	2300.
1947	-	-	.03	.94	.13	.11	.04	.04	.06	.07	-	-	.17	3700.
1948	-	-	.01	1.3	.17	.00	.00	.02	.03	.04	-	-	.20	4100.
1949	-	-	.08	.23	.16	.03	.03	.02	.04	.05	-	-	.08	1700.
1950	-	-	.00	.41	.13	.01	.05	.05	.05	.05	-	-	.10	2000.
1951	-	-	.00	.66	.17	.24	.15	.08	.06	.07	-	-	.18	3700.
1952	-	-	.00	.28	.18	.12	.08	.04	.04	.05	-	-	.10	2100.
1953	-	-	.00	.00	.16	.13	.10	.05	.05	.05	-	-	.07	1500.
1954	-	-	.00	.13	.05	.03	.01	.05	.15	.02	-	-	.06	1200.
1955	-	-	.08	.16	.08	.02	.00	.01	.00	.01	-	-	.04	930.
1956	-	-	.00	1.6	.12	.06	.18	.04	.08	.03	-	-	.26	5500.
1957	-	-	.09	.12	.04	.01	.00	.02	.03	.02	-	-	.04	870.
1958	-	-	.00	.77	.04	.02	.01	.02	.00	.00	-	-	.11	2200.
1959	-	-	.07	.01	.02	.00	.00	.00	.00	.00	-	-	.01	300.
1960	-	-	.16	.02	.01	.00	.00	.00	.00	.00	-	-	.02	500.
1961	-	-	.01	.01	.01	.00	.00	.00	.00	.00	-	-	.01	110.
1962	-	-	.00	.15	.01	.00	.58	.04	.02	.00	-	-	.10	2100.
1963	-	-	.39	.06	.03	.04	.52	.01	.00	.00	-	-	.13	2800.
1964	-	-	.00	.01	.04	.00	.00	.00	.00	.00	-	-	.01	150.
1965	-	-	.00	1.9	.08	.09	.09	.00	.00	.03	-	-	.27	5800.
1966	-	-	.05	.04	.02	.01	.00	.00	.00	.01	-	-	.02	430.
1967	-	-	.00	.33	.20	.06	.03	.00	.00	.00	-	-	.08	1600.
1968	-	-	.31	.05	.01	.00	.00	.00	.06	.09	-	-	.06	1400.
1969	-	-	.00	1.8	.04	.00	.00	.00	.02	.00	-	-	.23	4900.
1970	-	-	.00	.57	.03	.00	.00	.18	.03	.00	-	-	.10	2100.
1971	-	-	.00	1.3	.23	.00	.00	.16	.01	.02	-	-	.21	4500.
1972	-	-	.09	.18	.02	.01	.01	.00	.15	.04	-	-	.06	1300.
1973	-	-	.01	.05	.01	.41	.13	.00	.04	.02	-	-	.08	1800.
1974	-	-	.00	1.2	.06	.04	.00	.03	.00	.03	-	-	.16	3500.
1975	-	-	.00	.14	.21	.10	.03	.02	.06	.01	-	-	.07	1500.
1976	-	-	.05	.28	.08	.10	.07	.00	.02	.03	-	-	.08	1600.
1977	-	-	.00	.02	.22	.00	.00	.00	.00	.00	-	-	.03	640.
1978	-	-	.14	.10	.00	.00	.00	.00	.00	.00	-	-	.03	650.
1979	-	-	.30	.02	.15	.00	.00	.00	.00	.00	-	-	.06	1300.
1980	-	-	.01	.25	.09	.00	.00	.00	.00	.00	-	-	.04	930.
MEAN	-	-	.04	.45	.14	.09	.07	.04	.04	.04	-	-	.11	2400.
MAX	-	-	.39	1.9	.43	.41	.58	.18	.15	.23	-	-	.28	6000.
MIN	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.01	110.

UNSHADED AREA DENOTES NATURAL FLOWS ESTIMATED BY PRORATING COMPUTED FLOWS IN TABLE D-2 ON THE BASIS OF DRAINAGE AREA RATIO.

SHADED AREA DENOTES NATURAL FLOWS ESTIMATED BY PRORATING ESTIMATED FLOWS IN TABLE D-2 ON THE BASIS OF DRAINAGE AREA RATIO. EXTREME CARE SHOULD BE TAKEN IN USING THESE FLOWS.

TABLE D-4

SUMMARY OF REGRESSION ANALYSES

Month	Dependent Variable	Independent Variables	Period of Record Used In Analysis	Mean Q_E, in m^3/s	Correlation Coefficient	Standard Error in % of Mean Q_E
March	log Q_E	log Q_M	1967-80	.10	.95	90
	log Q_E	log Q_B	1921-29,36	.02	.60	230
	log Q_E	log Q_{BU}	1967-79	.10	.72	320
	log Q_E	log Q_{BB}	1921,24-26,29,68-79	.08	.45	460
	log Q_E	log Q_{BB}	1968-79	.11	.72	315
	Q_E	$P_{Nov.-Mar.}T_{Mar.}$	1921-29,36,67-80	.06	.74	140
April	log Q_E	log Q_M	1967-80	.66	.93	55
	log Q_E	log Q_B	1921-30,36	.58	.82	55
	log Q_E	log Q_{BU}	1967-79	.68	.66	140
	log Q_E	log Q_{BB}	1921-30,68-79	.64	.69	110
	log Q_E	log Q_{BB}	1921-30	.57	.91	43
	log Q_E	log Q_{BB}	1968-79	.70	.78	120
	Q_E	$P_{Sep.-Oct.}P_{Nov.-Mar.}Q_{Mar.}$	1921-30,67-80	.64	.87	60
May	log Q_E	log Q_M	1967-80	.14	.62	160
	log Q_E	log Q_B	1921-30,36	.34	.16	53
	log Q_E	log Q_{BU}	1967-79	.14	.44	200
	log Q_E	log Q_{BB}	1920-30,36,67-79	.24	.20	210
	log Q_E	log Q_{BB}	1920-30,36	.35	.40	60
	log Q_E	log Q_{BB}	1967-79	.14	.42	210
	Q_E	$P_{May}Q_{Mar.}Q_{Apr.}$	1921-29,36,67-80	.23	.40	78
	Q_E	$P_{May}Q_{Mar.}Q_{Apr.}$	1921-29,36	.36	.52	50
June	log Q_E	log Q_M	1967-80	.08	.89	120
	log Q_E	log Q_B	1921-30,36	.22	.02	48
	log Q_E	log Q_{BU}	1967-79	.08	.42	380
	log Q_E	log Q_{BB}	1920-30,36,67-79	.15	.16	410
	log Q_E	log Q_{BB}	1920-30,36	.22	.30	45
	log Q_E	log Q_{BB}	1967-79	.08	.42	380
	Q_E	$P_{Jun.}Q_{Apr.}Q_{May}$	1921-30,36,67-80	.14	.47	110
	Q_E	$P_{Jun.}Q_{Apr.}Q_{May}$	1921-30,36	.22	.84	33
July	log Q_E	log Q_M	1967-80	.03	.80	140
	log Q_E	log Q_B	1921-30	.16	.12	72
	log Q_E	log Q_{BU}	1967-79	.03	.28	320
	log Q_E	log Q_{BB}	1920-30,67-79	.09	.11	430
	log Q_E	log Q_{BB}	1920-30	.16	.42	61
	log Q_E	log Q_{BB}	1967-79	.03	.30	320
	Q_E	$P_{Jul.}Q_{Jun.}$	1920-30,67-80	.09	.76	81

TABLE D-4 (continued)

Month	Dependent Variable	Independent Variables	Period of Record Used In Analysis	Mean Q_E, in m^3/s	Correlation Coefficient	Standard Error in % of Mean Q_E
August	log Q_E	log Q_M	1967-80	.04	.62	270
	log Q_E	log Q_{BU}	1967-79	.04	.51	330
	log Q_E	log Q_{BB}	1920-30,67-79	.06	.23	410
	log Q_E	log Q_{BB}	1920-30	.09	.57	38
	log Q_E	log Q_{BB}	1967-79	.04	.56	310
	Q_E	$P_{Aug.}Q_{Jul.}$	1920-30,67-80	.06	.16	136
	Q_E	$P_{Aug.}Q_{Jul.}$	1920-30	.09	.67	41
September	log Q_E	log Q_M	1967-80	.04	.69	220
	log Q_E	log Q_{BU}	1967-79	.04	.08	390
	log Q_E	log Q_{BB}	1920-30,67-79	.06	.09	300
	log Q_E	log Q_{BB}	1920-30	.08	.50	35
	log Q_E	log Q_{BB}	1967-79	.04	.14	390
	Q_E	$P_{Sep.}Q_{Aug.}$	1920-30,67-80	.06	.25	92
	Q_E	$P_{Sep.}Q_{Aug.}$	1920-30	.08	.69	33
October	log Q_E	log Q_M	1967-80	.02	.59	220
	log Q_E	log Q_{BU}	1967-79	.03	.30	300
	log Q_E	log Q_{BB}	1920-30,67-79	.07	.09	300
	log Q_E	log Q_{BB}	1920-30	.12	.29	48
	log Q_E	log Q_{BB}	1967-79	.03	.35	290
	Q_E	$Q_{Sep.}$	1920-30,67-80	.07	.64	86
	Q_E	$Q_{Sep.}$	1920-30	.12	.76	44

EXPLANATION OF SYMBOLS:

Q_E = natural flow at WSC Station No. 05GA007 on Eyehill Creek near Macklin for the month indicated, in cubic metres per second.

$Q_{Mar.}$ = natural flow at WSC Station No. 05GA007 on Eyehill Creek near Macklin for the month of March, in cubic metres per second; similarly for April ($Q_{Apr.}$), May (Q_{May}), June ($Q_{Jun.}$), July ($Q_{Jul.}$), August ($Q_{Aug.}$), and September ($Q_{Sep.}$).

Q_M = natural flow at WSC Station No. 05GA003 on Monitor Creek near Monitor for the month indicated, in cubic metres per second.

Q_B = natural flow at WSC Station No. 05CH002 on Berry Creek near Wardlow for the month indicated, in cubic metres per second.

Q_{BU} = natural flow at WSC Station No. 05FE001 on Battle River near Unwin for the month indicated, in cubic feet per second.

Q_{BB} = natural flow at WSC Station No. 05FF001 on Battle River at Battleford for the month indicated, in cubic feet per second.

$P_{Sep.-Oct.}$ = total precipitation in the Eyehill Creek Basin during September and October of the preceding year, in millimetres.

$P_{Nov.-Mar.}$ = total precipitation in the Eyehill Creek Basin from November of the preceding year to March of the current year, in millimetres.

P_{May} = precipitation in the Eyehill Creek Basin during May of the current year, in millimetres; similarly for June ($P_{Jun.}$), July ($P_{Jul.}$), August ($P_{Aug.}$), and September ($P_{Sep.}$).

$T_{Mar.}$ = temperature index for the month of March in the current year, computed as follows:

$$T_{Mar.} = \sum_{i=1}^{31} T'_{Mar.,i}$$

where $T'_{Mar.,i}$ is the maximum temperature on the i^{th} day of March, in degrees Celsius, if the maximum temperature exceeds 0.0°C.

NOTES: See next page.

TABLE D-4 (continued)

NOTES:

1. The correlation coefficients represent the degree of correlation between the dependent variables and the corresponding independent variables. Where the dependent and independent variables are in logarithmic units, the correlation coefficients represent the degree of correlation between the logarithms of the flows.

2. Standard error is a measure of the accuracy of flows estimated by a particular equation. An equation with variables in logarithmic units will over-estimate flows to a greater degree than it will under-estimate flows. For example, the standard error of an equation with variables in logarithmic units could have a lower limit of -50 percent and an upper limit of +100 percent. For ease of comparison, the standard errors in this table were computed as the average of the absolute values of the upper and lower limits.

APPENDIX E

COMPARISON OF WATER USES AND NATURAL FLOWS

TABLE E - 1
EYEHILL CREEK AT ALBERTA-SASKATCHEWAN BOUNDARY
PROPORTION OF NATURAL FLOW DEPLETED BY UPSTREAM PROJECTS
IN PERCENT

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MAR-OCT
1912	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1913	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1914	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1915	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1916	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1917	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1918	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1919	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1920	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1921	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1922	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1923	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1924	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1925	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1926	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1927	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1928	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1929	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1930	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1931	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1932	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1933	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1934	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1935	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1936	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1937	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1938	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1939	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1940	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1941	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1942	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1943	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00
1944	-	-	1.7	1.1	.14	.08	.07	.22	.99	.84	-	-	.56
1945	-	-	.00	.20	.38	1.3	1.8	1.8	1.8	1.3	-	-	.70
1946	-	-	.00	.02	.31	.18	1.8	1.1	1.0	.43	-	-	.37
1947	-	-	.00	.01	.32	.36	1.8	1.8	1.8	1.2	-	-	.30
1948	-	-	.00	-.01	.17	.00	.00	1.8	1.8	1.8	-	-	.12
1949	-	-	1.8	.50	.18	1.8	1.8	1.8	1.8	1.8	-	-	.91
1950	-	-	1.7	.30	.24	1.8	.38	1.5	1.8	.58	-	-	.52
1951	-	-	.00	.01	.10	.26	.00	.83	1.6	.62	-	-	.21
1952	-	-	.00	.01	.22	.42	.41	1.8	1.8	1.8	-	-	.48
1953	-	-	.00	.00	.19	.43	.15	1.8	1.8	1.8	-	-	.66
1954	-	-	1.5	.34	-.09	.97	1.7	.17	.46	1.8	-	-	.45
1955	-	-	.43	-.19	.57	1.8	1.7	1.8	1.7	1.8	-	-	.35
1956	-	-	1.5	.19	.38	-.65	.50	1.8	1.6	1.8	-	-	.32
1957	-	-	.32	.19	1.2	1.8	1.7	1.8	1.8	1.8	-	-	.74
1958	-	-	1.5	.25	.94	1.8	1.8	1.8	1.7	1.7	-	-	.36
1959	-	-	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.7	-	-	1.8
1960	-	-	3.1	2.1	6.0	20.	20.	20.	20.	20.	-	-	3.9
1961	-	-	4.5	2.2	4.3	20.	20.	20.	20.	20.	-	-	7.1
1962	-	-	19.	2.2	6.1	20.	.77	2.7	4.1	20.	-	-	1.3
1963	-	-	.46	-.41	1.8	.58	.33	5.1	20.	20.	-	-	.52
1964	-	-	8.2	2.3	2.6	20.	20.	20.	20.	20.	-	-	5.3
1965	-	-	19.	.32	.92	-.56	1.7	20.	20.	4.2	-	-	.45
1966	-	-	8.8	6.9	11.	13.	26.	9.9	27.	14.	-	-	10.
1967	-	-	.00	10.	8.0	5.4	15.	25.	.00	.00	-	-	9.3
1968	-	-	7.2	5.0	26.	28.	25.	25.	16.	10.	-	-	9.0
1969	-	-	.00	.20	7.0	.00	28.	.00	28.	29.	-	-	.68
1970	-	-	.00	4.2	14.	28.	28.	8.0	17.	.00	-	-	6.0
1971	-	-	.00	.76	2.5	.00	.00	7.5	24.	16.	-	-	2.0
1972	-	-	6.7	1.3	16.	28.	24.	28.	11.	12.	-	-	7.7
1973	-	-	9.7	6.0	28.	1.5	5.4	.00	18.	17.	-	-	4.5
1974	-	-	8.5	.70	3.2	7.9	.00	20.	.00	22.	-	-	1.9
1975	-	-	8.5	7.3	.41	2.4	15.	19.	13.	22.	-	-	5.4
1976	-	-	8.9	.56	7.8	3.9	3.4	.00	28.	16.	-	-	4.6
1977	-	-	.00	11.	3.8	.00	.00	.00	.00	.00	-	-	4.4
1978	-	-	24.	5.5	44.	90.	.00	.00	.00	.00	-	-	18.
1979	-	-	12.	8.9	1.8	*	.00	.00	.00	.00	-	-	8.6
1980	-	-	91.	11.	8.4	88.	88.	.00	.00	.00	-	-	12.

* TOTAL NET DEPLETION IN THIS MONTH IS A NEGATIVE VALUE, HOWEVER A PERCENTAGE CANNOT BE COMPUTED DUE TO ZERO NATURAL FLOW.

NOTE:

1. NEGATIVE VALUES INDICATE THAT ACTUAL FLOW AT ALBERTA-SASKATCHEWAN BOUNDARY IS GREATER THAN NATURAL FLOW DUE TO NEGATIVE NET EVAPORATION FROM UPSTREAM PROJECTS.

2. THIS TABLE WAS DERIVED BEFORE ROUNDING OFF NET DEPLETION VALUES AND THEREFORE DOES NOT AGREE EXACTLY WITH THE RATIO OF VALUES IN TABLE C-3 TO CORRESPONDING VALUES IN TABLE D-3.

TABLE E - 2
EYEMILL CREEK AT ALBERTA-SASKATCHEWAN BOUNDARY
FLOW RECEIVED BY SASKATCHEWAN IN EXCESS OF 50% NATURAL FLOW
IN CUBIC METRES PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN FOR MAR-OCT	VOLUME DAM3
1912	-	-	.00	.00	.08	.08	.07	.04	.04	.04	-	-	.04	920.
1913	-	-	.00	.27	.08	.00	.01	.03	.03	.03	-	-	.06	1200.
1914	-	-	.00	.09	.10	.11	.05	.03	.04	.04	-	-	.06	1200.
1915	-	-	.01	.68	.08	.08	.05	.02	.02	.03	-	-	.12	2500.
1916	-	-	.01	.06	.10	.10	.05	.06	.04	.04	-	-	.06	1200.
1917	-	-	.00	.15	.08	.03	.01	.02	.02	.03	-	-	.04	800.
1918	-	-	.10	.10	.06	.00	.00	.01	.02	.02	-	-	.04	850.
1919	-	-	.00	.05	.08	.04	.01	.03	.03	.03	-	-	.03	670.
1920	-	-	.02	.38	.19	.10	.06	.03	.05	.06	-	-	.11	2300.
1921	-	-	.00	.68	.22	.08	.05	.03	.04	.04	-	-	.14	3000.
1922	-	-	.00	.17	.12	.05	.03	.02	.02	.03	-	-	.06	1200.
1923	-	-	.00	.05	.07	.06	.07	.07	.03	.04	-	-	.05	1000.
1924	-	-	.00	.02	.21	.16	.05	.02	.02	.03	-	-	.07	1400.
1925	-	-	.01	.24	.06	.06	.03	.02	.02	.03	-	-	.06	1200.
1926	-	-	.01	.13	.06	.05	.02	.02	.02	.02	-	-	.04	670.
1927	-	-	.00	.19	.12	.11	.10	.05	.05	.11	-	-	.09	1900.
1928	-	-	.03	.33	.16	.09	.06	.02	.02	.03	-	-	.09	2000.
1929	-	-	.00	.06	.11	.04	.02	.01	.02	.03	-	-	.04	790.
1930	-	-	.05	.08	.05	.08	.14	.03	.03	.04	-	-	.06	1300.
1931	-	-	.00	.54	.07	.11	.06	.03	.03	.03	-	-	.11	2300.
1932	-	-	.00	.33	.08	.01	.00	.02	.03	.03	-	-	.06	1300.
1933	-	-	.00	.34	.09	.06	.02	.01	.02	.03	-	-	.07	1500.
1934	-	-	.04	.39	.06	.00	.00	.02	.02	.03	-	-	.07	1400.
1935	-	-	.00	.21	.08	.00	.00	.01	.02	.03	-	-	.04	900.
1936	-	-	.01	.21	.08	.03	.00	.02	.02	.03	-	-	.05	1000.
1937	-	-	.00	.17	.09	.00	.00	.02	.03	.03	-	-	.04	890.
1938	-	-	.06	.42	.09	.08	.04	.03	.02	.03	-	-	.09	2000.
1939	-	-	.03	.29	.06	.07	.03	.02	.02	.03	-	-	.07	1500.
1940	-	-	.00	.18	.10	.03	.01	.01	.02	.03	-	-	.05	970.
1941	-	-	.00	.35	.08	.09	.04	.04	.03	.04	-	-	.08	1700.
1942	-	-	.02	.00	.07	.08	.04	.03	.03	.03	-	-	.04	760.
1943	-	-	.01	.30	.13	.06	.02	.04	.03	.03	-	-	.08	1600.
1944	-	-	.02	.27	.10	.14	.10	.08	.05	.06	-	-	.10	2200.
1945	-	-	.09	.06	.07	.03	.02	.04	.04	.04	-	-	.05	1000.
1946	-	-	.07	.14	.07	.08	.04	.05	.05	.05	-	-	.07	1400.
1947	-	-	.03	.48	.08	.07	.03	.03	.04	.04	-	-	.10	2100.
1948	-	-	.02	.67	.10	.01	.01	.02	.03	.03	-	-	.11	2300.
1949	-	-	.05	.13	.09	.03	.03	.02	.03	.04	-	-	.05	1100.
1950	-	-	.02	.22	.08	.02	.04	.04	.04	.04	-	-	.06	1300.
1951	-	-	.01	.34	.10	.13	.09	.05	.04	.05	-	-	.10	2100.
1952	-	-	.01	.16	.10	.07	.05	.03	.03	.04	-	-	.06	1300.
1953	-	-	.01	.01	.09	.08	.06	.04	.04	.04	-	-	.05	1000.
1954	-	-	.01	.08	.04	.03	.02	.04	.09	.02	-	-	.04	860.
1955	-	-	.05	.09	.05	.02	.02	.02	.01	.02	-	-	.04	740.
1956	-	-	.01	.80	.07	.04	.10	.03	.05	.03	-	-	.14	3000.
1957	-	-	.06	.07	.03	.02	.01	.02	.03	.02	-	-	.03	710.
1958	-	-	.01	.39	.03	.02	.02	.02	.01	.01	-	-	.07	1400.
1959	-	-	.05	.02	.02	.01	.01	.01	.01	.01	-	-	.02	420.
1960	-	-	.09	.02	.02	.01	.01	.01	.01	.01	-	-	.02	510.
1961	-	-	.02	.02	.02	.01	.01	.01	.01	.01	-	-	.02	330.
1962	-	-	.01	.08	.02	.01	.30	.03	.02	.01	-	-	.06	1300.
1963	-	-	.21	.04	.03	.03	.27	.02	.01	.01	-	-	.08	1700.
1964	-	-	.01	.02	.03	.01	.01	.01	.01	.01	-	-	.02	350.
1965	-	-	.01	.97	.05	.06	.06	.01	.01	.03	-	-	.15	3100.
1966	-	-	.03	.03	.02	.02	.01	.03	.01	.02	-	-	.02	450.
1967	-	-	.01	.14	.09	.04	.02	.01	.01	.01	-	-	.04	920.
1968	-	-	.14	.03	.01	.01	.01	.01	.03	.05	-	-	.04	830.
1969	-	-	.01	.89	.03	.01	.01	.01	.02	.01	-	-	.12	2600.
1970	-	-	.01	.27	.02	.01	.01	.09	.02	.01	-	-	.06	1200.
1971	-	-	.01	.63	.12	.01	.01	.08	.02	.02	-	-	.11	2400.
1972	-	-	.05	.10	.02	.02	.02	.01	.07	.03	-	-	.04	830.
1973	-	-	.02	.03	.01	.21	.07	.01	.03	.02	-	-	.05	1100.
1974	-	-	.01	.58	.04	.03	.01	.02	.01	.02	-	-	.09	1900.
1975	-	-	.01	.07	.11	.06	.02	.02	.04	.02	-	-	.04	940.
1976	-	-	.04	.15	.04	.06	.04	.01	.02	.02	-	-	.05	1000.
1977	-	-	.01	.02	.11	.01	.01	.01	.01	.01	-	-	.03	570.
1978	-	-	.04	.04	.00	.00	.00	.00	.00	.00	-	-	.01	210.
1979	-	-	.11	.01	.07	.00	.00	.00	.00	.00	-	-	.02	510.
1980	-	-	.00	.10	.04	.00	.00	.00	.00	.00	-	-	.02	350.

TABLE E - 3
EYEHILL CREEK AT ALBERTA-SASKATCHEWAN BOUNDARY
PROPORTION OF NATURAL FLOW DEPLETED BY UPSTREAM PROJECTS,
FOR PRESENT LEVEL OF DEVELOPMENT, IN PERCENT

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MAR-OCT
1912	-	-	.00	.00	17.	6.2	-.27	6.4	7.1	6.1	-	-	7.7
1913	-	-	.00	.12	2.9	58.	19.	15.	15.	6.4	-	-	4.1
1914	-	-	.15	.03	.91	3.2	15.	14.	9.1	1.7	-	-	4.5
1915	-	-	.15	-.10	.98	6.1	4.5	28.	19.	15.	-	-	2.0
1916	-	-	8.7	1.3	-.50	.36	6.4	1.3	11.	6.7	-	-	2.6
1917	-	-	.00	-.33	2.9	15.	62.	18.	19.	16.	-	-	6.6
1918	-	-	1.8	-.09	3.1	77.	.00	55.	27.	16.	-	-	6.2
1919	-	-	.00	8.7	6.1	16.	71.	16.	15.	10.	-	-	12.
1920	-	-	.15	.04	-.38	1.2	1.6	7.0	7.0	2.3	-	-	.99
1921	-	-	.00	-.42	.15	3.5	3.4	15.	4.4	7.9	-	-	1.0
1922	-	-	.00	-.14	.11	12.	20.	15.	16.	7.4	-	-	4.7
1923	-	-	.00	1.6	1.8	-2.8	1.4	4.5	12.	8.0	-	-	2.9
1924	-	-	.00	2.1	.37	3.0	10.	14.	19.	12.	-	-	4.2
1925	-	-	.15	-.45	3.9	.75	18.	24.	20.	13.	-	-	3.9
1926	-	-	.55	.40	-.34	9.9	24.	19.	18.	16.	-	-	6.1
1927	-	-	.00	.49	-1.4	1.6	-.68	9.7	6.8	2.1	-	-	1.5
1928	-	-	.00	.09	.99	1.2	5.7	19.	21.	14.	-	-	2.6
1929	-	-	.00	.79	.05	8.2	21.	31.	22.	14.	-	-	7.2
1930	-	-	4.8	-.84	4.3	-.55	1.1	19.	6.8	3.6	-	-	2.7
1931	-	-	.00	.16	1.9	2.1	3.2	19.	9.2	9.2	-	-	2.0
1932	-	-	.00	-.77	1.1	4.0	49.	23.	17.	14.	-	-	2.6
1933	-	-	5.8	.04	.21	6.6	27.	38.	17.	13.	-	-	3.7
1934	-	-	4.9	.11	5.6	.00	.00	43.	18.	15.	-	-	3.8
1935	-	-	.00	1.8	1.6	*	.00	46.	22.	14.	-	-	5.1
1936	-	-	8.7	1.4	1.2	14.	82.	25.	19.	15.	-	-	6.3
1937	-	-	.00	2.2	1.1	.00	.00	39.	15.	12.	-	-	6.1
1938	-	-	3.5	.22	-1.2	3.2	12.	17.	18.	5.4	-	-	2.5
1939	-	-	.15	.30	1.3	-.59	17.	21.	20.	15.	-	-	3.4
1940	-	-	.00	.43	-.07	5.8	26.	46.	20.	12.	-	-	4.2
1941	-	-	8.2	.64	1.1	4.5	11.	8.7	13.	7.7	-	-	3.4
1942	-	-	.09	*	2.7	1.8	3.7	17.	14.	11.	-	-	5.2
1943	-	-	.15	.34	-1.1	2.6	19.	10.	18.	7.1	-	-	2.7
1944	-	-	.15	.15	1.3	.70	.58	2.0	9.8	8.2	-	-	1.7
1945	-	-	.00	2.0	3.6	12.	26.	17.	17.	11.	-	-	6.9
1946	-	-	.15	.20	2.9	1.6	18.	10.	9.7	4.1	-	-	3.7
1947	-	-	.05	.13	3.0	3.5	25.	21.	13.	10.	-	-	3.0
1948	-	-	.15	-.07	1.6	.00	.00	71.	34.	19.	-	-	2.2
1949	-	-	8.8	3.6	1.8	26.	23.	33.	21.	15.	-	-	8.7
1950	-	-	8.6	1.9	2.2	24.	1.3	15.	19.	4.3	-	-	4.4
1951	-	-	.00	.14	.85	2.6	-.18	8.1	16.	6.0	-	-	2.0
1952	-	-	.00	.15	2.1	4.1	3.8	19.	19.	16.	-	-	4.7
1953	-	-	.00	.00	1.6	4.2	1.3	18.	21.	17.	-	-	6.8
1954	-	-	7.7	3.0	-1.2	9.1	43.	-2.5	4.5	25.	-	-	4.5
1955	-	-	2.0	-1.9	5.4	23.	69.	77.	88.	64.	-	-	6.7
1956	-	-	25.	1.2	3.7	-7.1	5.0	21.	14.	23.	-	-	2.7
1957	-	-	1.6	2.1	12.	43.	86.	34.	24.	25.	-	-	10.0
1958	-	-	6.5	1.4	8.9	43.	69.	52.	88.	88.	-	-	4.6
1959	-	-	16.	17.	24.	86.	86.	86.	68.	88.	-	-	23.
1960	-	-	15.	14.	35.	86.	86.	86.	88.	86.	-	-	19.
1961	-	-	58.	34.	30.	86.	86.	86.	88.	88.	-	-	52.
1962	-	-	81.	16.	38.	86.	4.2	16.	30.	88.	-	-	8.3
1963	-	-	2.2	-4.8	6.1	-2.0	1.1	34.	88.	88.	-	-	1.9
1964	-	-	81.	59.	15.	86.	86.	86.	88.	88.	-	-	32.
1965	-	-	81.	1.6	3.7	-7.5	11.	86.	88.	44.	-	-	2.4
1966	-	-	9.4	12.	29.	37.	86.	22.	68.	78.	-	-	22.
1967	-	-	.00	5.6	3.2	7.5	26.	81.	.00	.00	-	-	6.0
1968	-	-	9.6	7.6	39.	90.	81.	81.	23.	12.	-	-	13.
1969	-	-	.00	.13	9.8	.00	90.	.00	78.	77.	-	-	1.3
1970	-	-	.00	4.4	21.	34.	75.	11.	33.	.00	-	-	7.9
1971	-	-	.00	.85	3.5	.00	.00	11.	53.	27.	-	-	2.8
1972	-	-	6.9	1.9	26.	67.	41.	90.	14.	18.	-	-	11.
1973	-	-	8.7	5.7	51.	1.8	7.5	.00	30.	26.	-	-	6.2
1974	-	-	8.5	.62	3.7	10.	.00	35.	.00	41.	-	-	2.6
1975	-	-	8.5	6.9	.25	2.9	22.	34.	19.	34.	-	-	7.0
1976	-	-	8.9	.60	11.	5.1	4.2	.00	62.	24.	-	-	6.6
1977	-	-	.00	15.	3.4	.00	.00	.00	.00	.00	-	-	4.4
1978	-	-	21.	5.5	44.	90.	.00	.00	.00	.00	-	-	16.
1979	-	-	12.	8.9	1.8	*	.00	.00	.00	.00	-	-	8.6
1980	-	-	91.	11.	8.4	88.	88.	.00	.00	.00	-	-	12.

* TOTAL NET DEPLETION IN THIS MONTH IS A NEGATIVE VALUE, HOWEVER A PERCENTAGE CANNOT BE COMPUTED DUE TO ZERO NATURAL FLOW.

NOTES:

1. NEGATIVE VALUES INDICATE THAT ACTUAL FLOW AT ALBERTA-SASKATCHEWAN BOUNDARY IS GREATER THAN NATURAL FLOW DUE TO NEGATIVE NET EVAPORATION FROM UPSTREAM PROJECTS.

2. THIS TABLE WAS DERIVED BEFORE ROUNDING OFF NET DEPLETION VALUES AND THEREFORE DOES NOT AGREE EXACTLY WITH THE RATIO OF VALUES IN TABLE C-4 TO CORRESPONDING VALUES IN TABLE D-3.

TABLE E - 4

EYEHILL CREEK AT ALBERTA-SASKATCHEWAN BOUNDARY

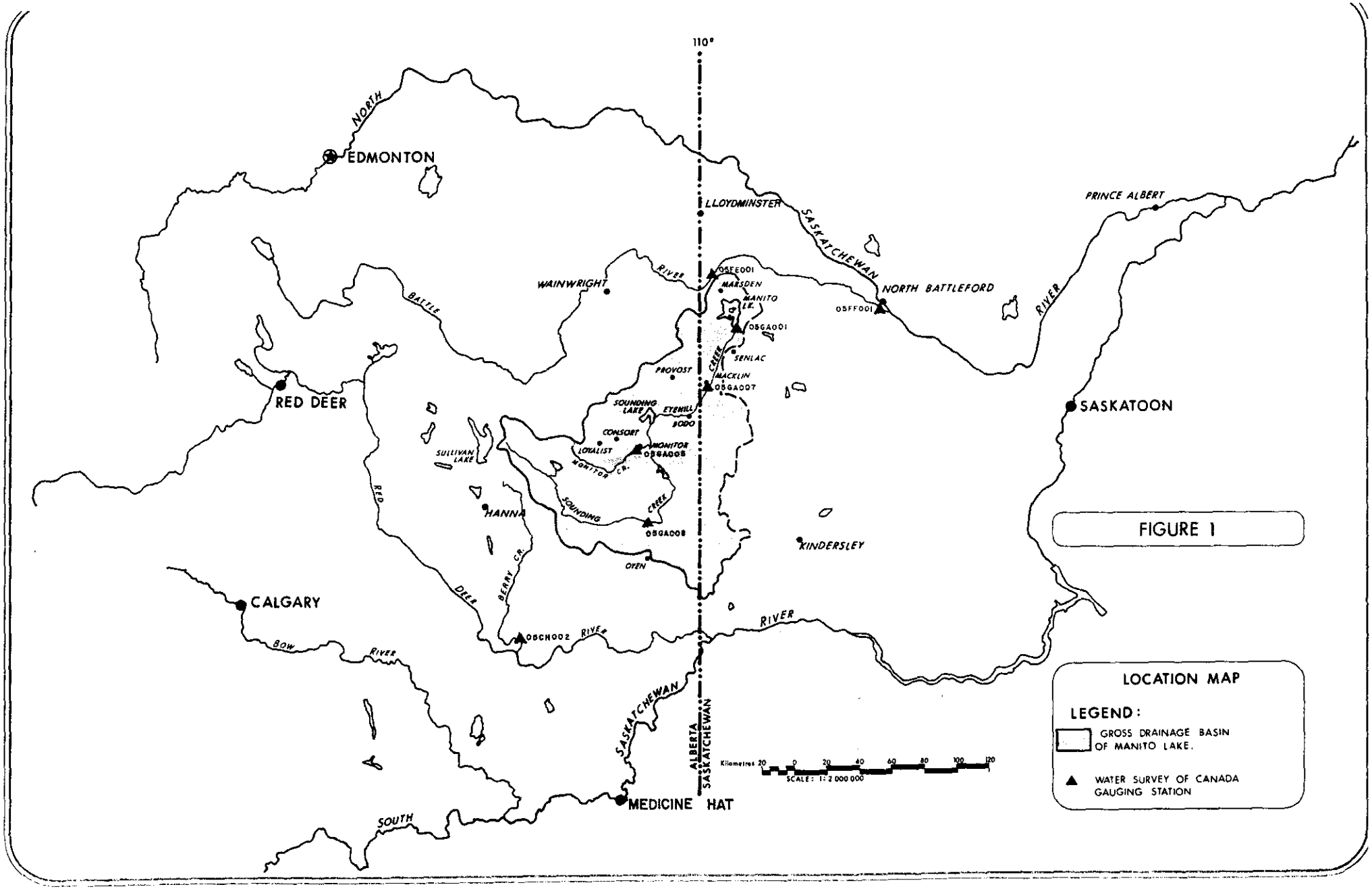
FLOW RECEIVED BY SASKATCHEWAN IN EXCESS OF 50% NATURAL FLOW

FOR PRESENT LEVEL OF DEVELOPMENT, IN CUBIC METRES PER SECOND

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN FOR MAR-OCT	VOLUME DAM^3
1912	-	-	.00	.00	.05	.07	.07	.04	.03	.03	-	-	.04	780.
1913	-	-	.00	.27	.07	.00	.01	.02	.02	.03	-	-	.05	1100.
1914	-	-	.00	.09	.10	.10	.03	.03	.03	.04	-	-	.05	1100.
1915	-	-	.01	.68	.07	.07	.04	.01	.01	.02	-	-	.11	2400.
1916	-	-	.01	.06	.10	.10	.04	.05	.03	.03	-	-	.05	1100.
1917	-	-	.00	.15	.07	.02	.00	.01	.01	.02	-	-	.04	750.
1918	-	-	.10	.10	.06	.00	.00	.00	.01	.01	-	-	.03	730.
1919	-	-	.00	.04	.07	.03	.00	.02	.02	.03	-	-	.02	510.
1920	-	-	.02	.38	.19	.09	.06	.03	.04	.05	-	-	.11	2300.
1921	-	-	.00	.69	.21	.07	.05	.02	.04	.03	-	-	.14	2900.
1922	-	-	.00	.17	.12	.04	.02	.02	.02	.02	-	-	.05	1100.
1923	-	-	.00	.05	.07	.06	.07	.06	.02	.03	-	-	.05	960.
1924	-	-	.00	.02	.21	.15	.04	.02	.02	.02	-	-	.06	1500.
1925	-	-	.01	.25	.06	.06	.02	.01	.01	.02	-	-	.05	1100.
1926	-	-	.01	.13	.06	.04	.01	.01	.01	.01	-	-	.04	770.
1927	-	-	.00	.19	.12	.11	.10	.04	.04	.11	-	-	.09	1900.
1928	-	-	.03	.33	.16.	.09	.05	.02	.01	.02	-	-	.09	1900.
1929	-	-	.00	.06	.11	.04	.01	.01	.01	.02	-	-	.03	670.
1930	-	-	.04	.08	.04	.08	.14	.02	.02	.04	-	-	.06	1200.
1931	-	-	.00	.54	.06	.10	.06	.02	.02	.03	-	-	.10	2200.
1932	-	-	.00	.34	.08	.01	.00	.01	.02	.02	-	-	.06	1200.
1933	-	-	.00	.33	.09	.05	.01	.00	.02	.02	-	-	.07	1400.
1934	-	-	.04	.39	.05	.00	.00	.00	.01	.02	-	-	.06	1300.
1935	-	-	.00	.20	.08	.00	.00	.00	.01	.02	-	-	.04	810.
1936	-	-	.01	.20	.08	.02	.00	.01	.01	.02	-	-	.04	900.
1937	-	-	.00	.16	.09	.00	.00	.00	.02	.02	-	-	.04	780.
1938	-	-	.06	.41	.09	.08	.03	.02	.02	.02	-	-	.09	1900.
1939	-	-	.03	.29	.06	.07	.02	.01	.01	.02	-	-	.06	1400.
1940	-	-	.00	.18	.10	.02	.01	.00	.01	.02	-	-	.04	890.
1941	-	-	.00	.34	.08	.08	.03	.03	.02	.03	-	-	.08	1600.
1942	-	-	.02	.00	.06	.07	.04	.02	.02	.02	-	-	.03	680.
1943	-	-	.01	.30	.13	.06	.01	.03	.02	.03	-	-	.07	1600.
1944	-	-	.00	.26	.09	.13	.09	.06	.03	.04	-	-	.09	1800.
1945	-	-	.08	.04	.05	.01	.01	.02	.02	.02	-	-	.03	660.
1946	-	-	.06	.13	.06	.06	.02	.03	.03	.03	-	-	.05	1100.
1947	-	-	.01	.47	.06	.05	.01	.01	.02	.03	-	-	.08	1700.
1948	-	-	.00	.66	.08	.00	.00	.00	.01	.01	-	-	.09	2000.
1949	-	-	.03	.11	.08	.01	.01	.00.	.01	.02	-	-	.03	690.
1950	-	-	.00	.20	.06	.00	.03	.02	.02	.03	-	-	.04	920.
1951	-	-	.00	.33	.08	.11	.08	.03	.02	.03	-	-	.08	1800.
1952	-	-	.00	.14	.08	.05	.04	.01	.01	.02	-	-	.05	960.
1953	-	-	.00	.00	.08	.06	.05	.02	.01	.02	-	-	.03	630.
1954	-	-	.00	.06	.03	.01	.00	.03	.07	.01	-	-	.03	530.
1955	-	-	.04	.08	.03	.01	.00	.00	.00	.00	-	-	.02	400.
1956	-	-	.00	.77	.06	.03	.08	.01	.03	.01	-	-	.12	2600.
1957	-	-	.04	.06	.02	.00	.00	.00	.01	.00	-	-	.02	350.
1958	-	-	.00	.37	.02	.00	.00	.00	.00	.00	-	-	.05	1000.
1959	-	-	.02	.01	.01	.00	.00	.00	.00	.00	-	-	.00	79.
1960	-	-	.05	.01	.00	.00	.00	.00	.00	.00	-	-	.01	160.
1961	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	-1.9
1962	-	-	.00	.05	.00	.00	.27	.01	.00	.00	-	-	.04	880.
1963	-	-	.19	.03	.01	.02	.25	.00	.00	.00	-	-	.06	1400.
1964	-	-	.00	.00	.01	.00	.00	.00	.00	.00	-	-	.00	27.
1965	-	-	.00	.93	.04	.05	.04	.00	.00	.00	-	-	-13	2700.
1966	-	-	.02	.02	.00	.00	.00	.01	.00	.00	-	-	.01	120.
1967	-	-	.00	.15	.09	.03	.01	.00	.00	.00	-	-	.03	710.
1968	-	-	.12	.02	.00	.00	.00	.00	.02	.03	-	-	.02	510.
1969	-	-	.00	.91	.02	.00	.00	.00	.00	.00	-	-	.11	2400.
1970	-	-	.00	.26	.01	.00	.00	.07	.00	.00	-	-	.04	890.
1971	-	-	.00	.64	.10	.00	.00	.06	.00	.01	-	-	.10	2100.
1972	-	-	.04	.09	.00	.00	.00	.00	.05	.01	-	-	.02	520.
1973	-	-	.01	.02	.00	.20	.06	.00	.01	.01	-	-	.04	770.
1974	-	-	.00	.58	.03	.02	.00	.00	.00	.00	-	-	.08	1800.
1975	-	-	.00	.06	.10	.05	.01	.00	.02	.00	-	-	.03	650.
1976	-	-	.02	.14	.03	.04	.03	.00	.00	.01	-	-	.03	710.
1977	-	-	.00	.01	.10	.00	.00	.00	.00	.00	-	-	.01	290.
1978	-	-	.04	.04	.00	.00	.00	.00	.00	.00	-	-	.01	220.
1979	-	-	.11	.01	.07	.00	.00	.00	.00	.00	-	-	.03	520.
1980	-	-	.00	.10	.04	.00	.00	.00	.00	.00	-	-	.02	350.
MEAN	-	-	.02	.22	.07	.04	.03	.01	.01	.02	-	-	.05	1100.
MAX	-	-	.19	.93	.21	.20	.27	.07	.07	.11	-	-	.14	2900.
MIN	-	-	.00	.00	.00	.00	.00	.00	.00	.00	-	-	.00	-1.9

NOTE:

1. NEGATIVE VALUE INDICATES THAT SASKATCHEWAN WOULD HAVE RECEIVED LESS THAN 50% OF THE NATURAL FLOW.


110°
NORTH
EDMONTON
LLOYDMINSTER
SASKATCHEWAN
PRINCE ALBERT
WAINWRIGHT
BATTLE
RIVER
05EE001
MARSDEN
MANITO L.K.
NORTH BATTLEFORD
05FF001
RIVER
05GA001
SENLAC
CREEK
PROVOST
MACKLIN
05GA007
RED DEER
SOUNDING LAKE
ETHEL L.K.
BODO
SASKATOON
CONSORT
LOYALIST
MONITOR
05GA005
SULLIVAN LAKE
MONITOR CR.
RED
HANNA
SOUNDING
CREEK
05GA008
KINDERSLEY
OYEN
CALGARY
DEER
BERRY CR.
05CH002
RIVER
BOW
RIVER
RIVER
SASKATCHEWAN
ALBERTA
SASKATCHEWAN
Kilometres 20 0 20 40 60 80 100 120
SCALE: 1:2 000 000
MEDICINE HAT
SOUTH
FIGURE 1
LOCATION MAP
LEGEND:
GROSS DRAINAGE BASIN OF MANITO LAKE.
WATER SURVEY OF CANADA GAUGING STATION

DRAINAGE AREAS FOR EYEHILL CREEK

LOCATION	GROSS DRAINAGE AREA, km²			EFFECTIVE DRAINAGE AREA, km²		
	ALTA.	SASK.	TOTAL	ALTA.	SASK.	TOTAL
EYEHILL CREEK AT SOUNDING LAKE	8280	280	8560	0	0	0
EYEHILL CREEK AT ALTA.-SASK. BDY.	8840	290	9130	128	2	130
EYEHILL CREEK AT WSC STATION No. 05GA007	8890	1030	9920	130	60	190
EYEHILL CREEK AT WSC STATION No. 05GA001	8930	1660	10,590	130	220	350
EYEHILL CREEK AT MANITO LAKE	8930	3030	11,960	130	260	390

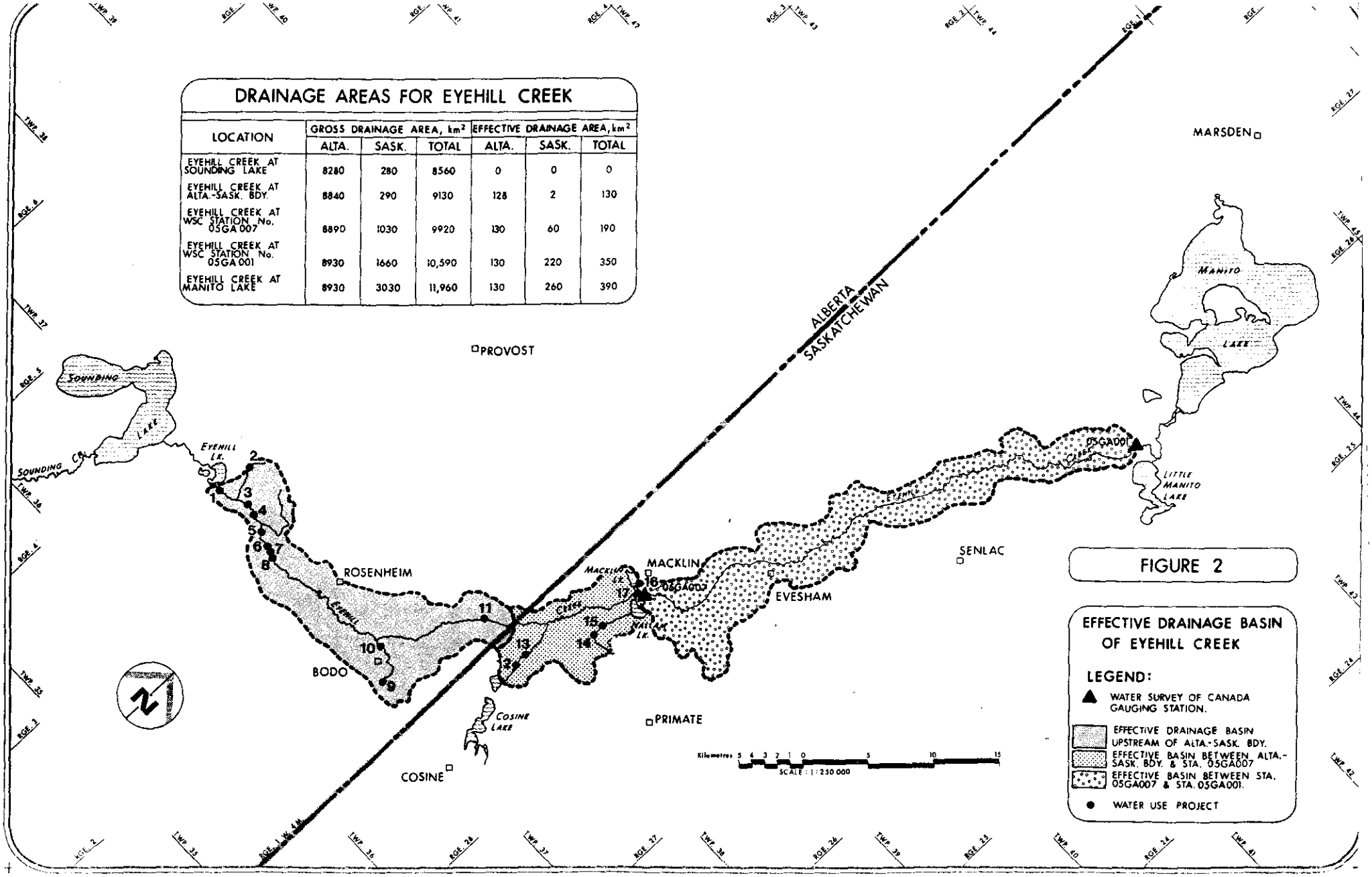


FIGURE 2

EFFECTIVE DRAINAGE BASIN OF EYEHILL CREEK

LEGEND:

- ▲ WATER SURVEY OF CANADA GAUGING STATION.
- EFFECTIVE DRAINAGE BASIN UPSTREAM OF ALTA.-SASK. BDY.
- EFFECTIVE BASIN BETWEEN ALTA.-SASK. BDY. & STA. 05GA007
- EFFECTIVE BASIN BETWEEN STA. 05GA007 & STA. 05GA001.
- ● WATER USE PROJECT