Report to

THE INTERNATIONAL JOINT COMMISSION

on

THE DIVISION OF THE WATERS OF THE

ST. MARY AND MILK RIVERS

1989

by

Philip Cohen

representing the United States

and

R.A. Halliday

representing Canada

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International Joint Commission
Ottawa, Ontario and Washington, D.C.

Gentlemen:

In compliance with the provisions of Article VI of the Boundary Waters Treaty of 1909 and Clause VIII (c) of your order of October 4, 1921, directing the division of the waters of the St. Mary and Milk rivers between the United States and Canada, we are transmitting herewith a report on the operations during the irrigation season ended October 31, 1989.

Respectfully submitted,

Philip Cohen
Accredited Officer of the United States

R. A. Halliday
Accredited Officer of Her Majesty

SYNOPSIS

During the 1989 irrigation season, the natural flow of the St. Mary and Milk Rivers was 108 per cent and 84 per cent, respectively, of the long-term average.

The natural flow of the St. Mary River at the International Boundary during the irrigation season, April 1 to October 31, 1989, was 775 000 cubic decametres (dam^3) (628,000 acre-feet). Under the terms of the Boundary Waters Treaty, the Canadian share was 467 000 dam^3 (379,000 acre-feet). The total flow recorded at the International Boundary during the irrigation season was 101 per cent of the Canadian allotment.

The natural flow of the Milk River at the Eastern Crossing of the International Boundary from March 1 to October 31, 1989, was 117 000 dam^3 (94,900 acre-feet). Under the terms of the Treaty, the United States' allotment was 78 500 dam^3 (63,600 acre-feet). The United States received 149 per cent of its allotment at Eastern Crossing, in addition to its share of St. Mary River water diverted into the Milk River by the St. Mary Canal.

During 1989, the four member ad hoc task force, formed to investigate the sharing of the waters of the southern tributaries of the Milk River, held a meeting to update ranchers and farmers from both countries on task force activities. In addition, groundwater studies commenced, miscellaneous streamflow measurements were made and Commissioners Fulton and Totten visited the area.

The March to October natural flow of the three apportioned eastern tributaries of the Milk River, Lodge Creek, Battle Creek and Frenchman River, was 12, 27, and 28 per cent, respectively,

of the long-term averages. Deficits remained on Lodge Creek and on the Frenchman River at the end of the season. These deficits were not refunded due to extremely low flows and absence of stored water.

The annual conference of the Field Representatives was held in the Cypress Hills, Saskatchewan on January 31, 1990. Past operational problems were reviewed and resolved, program and study plans for 1990 were formulated, and streamflow and water level records collected by the United States and Canada were reviewed and approved.

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INTRODUCTION

Article VI of the Boundary Waters Treaty of 1909 between Great Britain and the United States governs the apportionment of the waters of the St. Mary and Milk rivers. The terms of the Treaty were further clarified by the 1921 Order of the International Joint Commission. Copies of Article VI and the 1921 Order are contained in Annex A of this report.

To comply with this Treaty, Field Representatives of the United States and Canada collected and compiled hydrometric data at 42 international gauging stations on a co-operative basis. An additional 28 gauging stations were operated independently by the United States or Canada to obtain data on diversions, reservoir contents, return flows and index runoff. Most of this additional information was used to improve the accuracy of natural flow computations.

This report summarizes the 1989 natural flow computations, apportionment of the natural flow, unusual occurrences during the year, and procedural modifications designed to increase the accuracy of the natural flow computations. Summary natural flow tables are included. Detailed natural flow computations are included in Appendix A. Daily discharge and other related data are included in Appendix B. Appendices A and B are submitted with this report under separate cover.

In accordance with the International System of Units (SI) conversion schedule established by the International Joint Commission, this report uses SI units first, followed by inch-pound units in parentheses. Data in tables are shown in SI units first, followed by the respective inch-pound units (for example, Tables 1 and 1A).

The format for Appendices A and B of the report is SI units only. All Canadian data are collected, computed and published in SI

units. The United States' data, which are collected and computed in inch-pound units, were converted to SI units using the appropriate conversions. A summary of the conversion factors is contained in Annex B.

On May 11, 1989, Mr. R.A. Halliday, Regional Director, Environment Canada, was named to replace Mr. D.A. Davis as the Canadian Accredited Officer to carry out the provisions of the Boundary Waters Treaty.

Mr. Philip Cohen, Chief Hydrologist, United States Geological Survey, as Accredited Officer of the United States, was represented in the field by Mr. J.A. Moreland, District Chief, United States Geological Survey, Helena, Montana. Mr. R.A. Halliday, as Accredited Officer of Her Majesty, was represented in the field by Mr. G.H. Morton, Chief, Water Resources Branch, Calgary, Alberta and Mr. R.G. Boals, Chief, Water Resources Branch, Regina, Saskatchewan. This report was prepared jointly by personnel of the United States Geological Survey and Environment Canada, Water Resources Branch, under the supervision of Messrs. Moreland, Morton and Boals.

The annual conference of the Field Representatives was held in the Cypress Hills, Saskatchewan on January 31, 1990. Streamflow records collected jointly by the United States and Canada were reviewed and approved. Mutual problems, future plans, and changes in computational procedures were discussed and a schedule of field operations for 1990 was adopted.

ST. MARY RIVER

During the irrigation season, April 1 to October 31, Canada's share of the natural flow of the St. Mary River at the International Boundary, as stipulated by the 1921 Order, is three-fourths of the natural flow when that flow is 666 cubic feet per second (18.86 cubic metres per second) or less. Flow in excess of that quantity is divided equally between Canada and the United States. During the non-irrigation season, November 1 to March 31, the flow is divided equally between the two countries.

To comply with the above Order, representatives of both countries make twice-monthly computations of the daily natural flow of the St. Mary River during the irrigation season. If use by the United States is in excess of its share, then a delivery of an equivalent quantity of water is normally made to Canada at the earliest opportunity. Regular interim reports of these computations are sent to all agencies involved in the water use and management of the flow of the St. Mary River. The interim reports keep these agencies informed as to the quantity of water that is available and the status of apportionment.

Tentative computations and interim reports are not made during the non-irrigation season when use by the United States is limited to storage in Lake Sherburne. The flow into Lake Sherburne is considerably less than 50 per cent of the natural flow. Occasionally, water is diverted into the St. Mary Canal during the non-irrigation season, necessitating additional tentative computations.

Lake Sherburne, the only storage reservoir within the St. Mary River Basin in the United States, is used to store part of the

United States' share of flow for later diversion to the Milk River. This water, which passes through Canada, is used by the United States for irrigation in the eastern portion of the Milk River basin.

Storage in Lake Sherburne (station 05AE036) was 24 300 dam^3 (19,700 acre-feet) on October 31, 1988 and increased to 40 600 dam^3 (32,900 acre-feet) on February 26, 1989 when releases began. It subsequently decreased to 29 900 dam^3 (24,200 acre-feet) on March 31, 1989, just prior to the commencement of the irrigation season. Maximum storage was 82 900 dam^3 (67,200 acre-feet) on July 21, 1989 and storage decreased to 8 320 dam^3 (6,740 acre-feet) by the end of the irrigation season on October 31, 1989.

Water was diverted from the St. Mary River into the Milk River via the St. Mary Canal from March 5 to October 26, 1989. The total flow recorded at the gauging station on the St. Mary Canal at St. Mary Crossing (station 05AE029) was 342 000 dam^3 (277,000 acre-feet). This volume represents the largest annual diversion since the opening of the canal in 1917. Any seepage from the canal between the point of diversion and the crossing of the St. Mary River is assumed to return to the river and eventually become available to Canada.

The total natural flow of the St. Mary River at the International Boundary from November 1, 1988 to October 31, 1989 was 856 000 dam^3 (694,000 acre-feet) of which 775 000 dam^3 (628,000 acre-feet) occurred during the irrigation season, April 1 to October 31, 1989. For the irrigation season, Canada's and the United States' shares were 467 000 dam^3 (379,000 acre-feet) and 308 000 dam^3 (250,000 acre-feet) respectively. A total discharge of 472 000 dam^3 (383,000 acre-feet) was recorded at the International Boundary, which was 101 per cent of the Canadian share. The

computed natural flow during the irrigation season was 108 per cent of the average of the previous 87 years of record.

Deficit deliveries were recorded in 5 of the 14 division periods during the 1989 irrigation season, and in all but one case were made up in the next division period. Canada requested that a portion of its share of the St. Mary River be diverted to the Milk River to permit continued irrigation by Canadian Milk River users. In all, 8 440 dam^3 (6,840 acre-feet) of the Canadian share was diverted to the Milk River system. This cooperative effort by both countries allowed irrigators on both sides of the International Boundary to make the best use of available water supplies.

The division of St. Mary River natural flow is summarized in Tables 1 and 1A which follow. These tables detail the portion of the Canadian share of the St. Mary River delivered to the Milk River. The column "BELOW SHARE, ACTUAL" includes the adjustments to the column "BELOW SHARE, APPARENT" for the Canadian share of the St. Mary River delivered to the Milk River. The detailed computation of the natural flow is given in Table 6 and the historical summary in Table 7 of Appendix A.

TABLE 1
SUMMARY OF DIVISION OF ST. MARY RIVER AND DIVERSION TO MILK RIVER[1]
1989
QUANTITIES IN CUBIC DECAMETRES

	ST. MARY RIVER AT INTERNATIONAL BOUNDARY				EXCESS REC'D. BY CANADA	CHANGE IN STORAGE LAKE SHERBURNE	TOTAL AVAILABLE FOR DIVERSION	ST. MARY CANAL AT ST. MARY CROSSING	MILK RIVER AT EASTERN CROSSING
	RECORDED FLOW	NATURAL FLOW	U.S. SHARE	CANADA'S SHARE					
APR	35 171	54 242	19 114	35 128	43	-20 538	39 593	39 550	53 024
MAY	92 079	157 516	66 135	91 381	698	13 804	52 331	51 633	62 467
JUN	153 751	257 205	116 384	140 821	12 930	50 725	65 659	52 729	76 369
JUL	73 706	131 873	53 312	78 561	- 4 855	5 790	47 522	52 377	57 542
AUG	46 243	70 791	23 383	47 408	- 1 165	-23 663	47 046	48 211	42 949
SEP	42 414	63 810	19 921	43 889	- 1 475	-24 289	44 210	45 685	46 319
OCT	28 878	39 884	10 134	29 750	- 872	-24 835	34 969	35 841	42 933
TOTAL IRRIGATION SEASON	472 242	775 321	308 383	466 938	5 304	-23 006	331 330	326 026	381 603

QUANTITIES FOR ST. MARY RIVER DIVISION PERIODS, IN CUBIC DECAMETRES

DIVISION PERIOD AT INTERNATIONAL BOUNDARY	NATURAL FLOW	CANADA'S SHARE	RECEIVED BY CANADA	RECEIVED BY CANADA		
				ABOVE SHARE	BELOW SHARE APPARENT	BELOW SHARE ACTUAL
APR 1 - APR 15	7 754	5 817	4 487		1 330	1 330
APR 16 - APR 30	46 488	29 311	30 684	1 373		
MAY 1 - MAY 15	87 732	49 975	50 914	939		
MAY 16 - MAY 31	69 784	41 406	41 165		241	241
JUN 1 - JUN 15	148 664	80 440	92 562	12 122		
JUN 16 - JUN 30	108 541	60 381	61 189	808		
JUL 1 - JUL 15	68 237	40 227	36 400		3 827	1 992
JUL 16 - JUL 31	63 636	38 334	37 306		1 028	(929)*
AUG 1 - AUG 15	29 569	20 894	20 337		557	(360)*
AUG 16 - AUG 31	41 222	26 514	25 906		608	(371)*
SEP 1 - SEP 15	38 671	25 445	24 525		920	3
SEP 16 - SEP 30	25 139	18 444	17 889		555	(362)*
OCT 1 - OCT 15	17 159	12 869	11 612		1 257	340
OCT 16 - OCT 31	22 725	16 881	17 266	385		

[1] This is a summary of data from Table 6, Appendix A.

* Above Share

TABLE 1A
SUMMARY OF DIVISION OF ST. MARY RIVER AND DIVERSION TO MILK RIVER[1]
1989
QUANTITIES IN ACRE-FEET

	ST. MARY RIVER AT INTERNATIONAL BOUNDARY				EXCESS REC'D. BY CANADA	CHANGE IN STORAGE LAKE SHERBURNE	TOTAL AVAILABLE FOR DIVERSION	ST. MARY CANAL AT ST. MARY CROSSING	MILK RIVER AT EASTERN CROSSING
	RECORDED FLOW	NATURAL FLOW	U.S. SHARE	CANADA'S SHARE					
APR	28,513	43,974	15,496	28,478	35	-16,650	32,098	32,063	42,987
MAY	74,649	127,698	53,616	74,083	566	11,191	42,425	41,859	50,642
JUN	124,646	208,516	94,353	114,164	10,482	41,123	53,230	42,747	61,912
JUL	59,754	106,910	43,220	63,690	- 3,936	4,694	38,526	42,462	46,649
AUG	37,489	57,390	18,957	38,434	- 944	-19,184	38,140	39,085	34,819
SEP	34,385	51,731	16,150	35,581	- 1,196	-19,691	35,841	37,037	37,551
OCT	23,411	32,334	8,216	24,118	- 707	-20,134	28,349	29,056	34,806
TOTAL IRRIGATION SEASON	382,847	628,554	250,006	378,547	4,300	-18,651	268,610	264,310	309,366

QUANTITIES FOR ST. MARY RIVER DIVISION PERIODS, IN ACRE-FEET

DIVISION PERIOD AT INTERNATIONAL BOUNDARY	NATURAL FLOW	CANADA'S SHARE	RECEIVED BY CANADA	RECEIVED BY CANADA		
				ABOVE SHARE	BELOW SHARE APPARENT	BELOW SHARE ACTUAL
APR 1 - APR 15	6,286	4,716	3,638		1,078	1,078
APR 16 - APR 30	37,688	23,762	24,876	1,113		
MAY 1 - MAY 15	71,124	40,515	41,276	761		
MAY 16 - MAY 31	56,574	33,568	33,373		195	195
JUN 1 - JUN 15	120,522	65,213	75,040	9,827		
JUN 16 - JUN 30	87,994	48,951	49,606	655		
JUL 1 - JUL 15	55,320	32,612	29,510		3,103	1,615
JUL 16 - JUL 31	51,590	31,077	30,244		833	(753)*
AUG 1 - AUG 15	23,972	16,939	16,487		452	(292)*
AUG 16 - AUG 31	33,419	21,495	21,002		493	(301)*
SEP 1 - SEP 15	31,351	20,628	19,882		746	2
SEP 16 - SEP 30	20,380	14,953	14,503		450	(293)*
OCT 1 - OCT 15	13,911	10,433	9,414		1,019	276
OCT 16 - OCT 31	18,423	13,685	13,998	312		

[1] All values are conversions of data from Table 1. Totals and shares may not add or subtract exactly as a result of rounding.

* Above Share

MILK RIVER

During the irrigation season, April 1 to October 31, the United States' share of the natural flow of the Milk River at the eastern crossing of the International Boundary, as stipulated by the 1921 Order, is three-fourths of the natural flow when that flow is 666 cubic feet per second (18.86 cubic metres per second) or less. Flows in excess of that quantity are divided equally between the United States and Canada. During the non-irrigation season, November 1 to March 31, the entire flow is divided equally between the two countries.

Prior to the mid-seventies, uses of the natural flow of the Milk River by Canada and the United States were assumed to be less than their respective shares and no formal apportionment was made. By 1977, it became apparent that the increasing numbers of sprinkler irrigation systems were capable of using all of the natural flow for long periods of time. Consequently, a more comprehensive natural flow computation and water division procedure was developed and has been used since 1985. The revised computation procedure includes an approximate accounting of irrigation consumptive uses in both countries, and the interbasin transfer of water in Canada. An additional refinement was made in 1988 when F.I. Morton's evapotranspiration model replaced the adjusted pan evaporation method in the natural flow computations.

During 1989, the United States' and Canada's respective estimated consumptive uses were 5 050 dam^3 (4,090 acre-feet) and 5 160 dam^3 (4,180 acre-feet), for a total of 10 200 dam^3 (8,270 acre-feet) or 9 per cent of the natural flow of the Milk River at the eastern crossing during the period March 1 to October 31, 1989. For the same period, the Canadian transfer of water into the Milk

River from Verdigris Coulee near the Mouth (station 11AA038) was 4 190 dam^3 (3,400 acre-feet) resulting in Canada's estimated consumptive use to be 970 dam^3 (790 acre-feet).

To comply with the 1921 Order, representatives of both countries now make tentative twice-monthly computations of the natural flow of the Milk River during the irrigation season. Additional computations are made when the natural flow is low and irrigation use is high. When Canada uses more than its share of the natural flow for an extended period of time, the Accredited Officers, after Field Representatives' consultation with the appropriate water management agencies, may agree to make up the Canadian deficit on the Milk River by reducing the Canadian share of the St. Mary River by an equal amount. These arrangements are made on an ad hoc basis as the situations arise, and, during 1989, these arrangements were made during the period July 1 to October 15.

The natural flow of the Milk River at the eastern crossing of the International Boundary from March 1 to October 31, 1989 was 117 000 dam^3 (94,900 acre-feet). This flow was 84 per cent of the average computed natural flow of the previous 77 years of record. It is important to note, however, that natural flow computations prior to 1985 did not account for consumptive use. Consequently, natural flow values after 1985 are not directly comparable with natural flows of previous years. The respective shares of the United States and Canada were 78 500 dam^3 (63,600 acre-feet) and 38 300 dam^3 (31,000 acre-feet).

The division of Milk River natural flow is summarized in Tables 2 and 2A, which follow. The detailed computation of natural flow is given in Table 8 and the historical summary in Table 9 of Appendix A.

TABLE 2

SUMMARY TABLE
NATURAL FLOW AND DELIVERIES OF
MILK RIVER AT THE EASTERN CROSSING
OF THE INTERNATIONAL BOUNDARY[1]

1989

QUANTITIES IN CUBIC DECAMETRES

PERIOD	NATURAL FLOW AT EASTERN CROSSING	SHARE		MILK RIVER AT EASTERN CROSSING	DIVERSION FROM ST. MARY BASIN	EXCESS(+)/ DEFICIT(-)/ DELIVERY TO U.S.	CUMULATIVE EXCESS(+)/ DEFICIT(-) U.S.
		U.S.	CANADA				
JAN 1 - JAN 31	277	138	138	-	-	+ 138	+ 138
FEB 1 - FEB 28	150	75	75	-	-	+ 75	+ 213
MAR 1 - MAR 31	31 551	15 776	15 776	37 776	6 186	+15 957	+16 170
APR 1 - APR 30	18 726	14 044	4 681	53 024	35 339	+ 4 952	+21 123
MAY 1 - MAY 31	18 417	13 812	4 604	62 467	48 396	+ 3 853	+24 976
JUN 1 - JUN 30	27 956	19 747	8 208	76 369	52 831	+ 8 184	+33 160
JUL 1 - JUL 31	10 192	7 644	2 548	57 542	51 033	+ 2 372	+35 531
AUG 1 - AUG 31	2 063	1 547	516	42 949	45 121	- 297	+35 234
SEP 1 - SEP 30	5 773	4 330	1 443	46 319	41 957	+ 1 485	+36 719
OCT 1 - OCT 31	2 158	1 619	540	42 933	41 722	+ 829	+37 548
NOV 1 - NOV 30	6 846	3 423	3 423	-	-	+ 3 540	+41 087
DEC 1 - DEC 31	4 584	2 292	2 292	-	-	+ 2 292	+43 380
TOTALS	128 692	84 448	44 245	419 380	322 587	+43 380	+43 380

[1] This is a summary of data from Table 8, Appendix A.

TABLE 2A

SUMMARY TABLE
NATURAL FLOW AND DELIVERIES OF
MILK RIVER AT THE EASTERN CROSSING
OF THE INTERNATIONAL BOUNDARY[1]

1989

QUANTITIES IN ACRE-FEET

PERIOD	NATURAL FLOW AT EASTERN CROSSING	SHARE		MILK RIVER AT EASTERN CROSSING	DIVERSION FROM ST. MARY BASIN	EXCESS(+)/ DEFICIT(-)/ DELIVERY TO U.S.
		U.S.	CANADA			
JAN 1 - JAN 31	224	112	112	-	-	+ 112
FEB 1 - FEB 28	121	61	61	-	-	+ 61
MAR 1 - MAR 31	25,579	12,790	12,790	30,626	5,015	+12,937
APR 1 - APR 30	15,181	11,386	3,795	42,987	28,650	+ 4,015
MAY 1 - MAY 31	14,931	11,198	3,733	50,643	39,235	+ 3,124
JUN 1 - JUN 30	22,664	16,009	6,655	61,913	42,831	+ 6,635
JUL 1 - JUL 31	8,263	6,197	2,066	46,650	41,373	+ 1,923
AUG 1 - AUG 31	1,672	1,254	418	34,820	36,580	- 241
SEP 1 - SEP 30	4,680	3,510	1,170	37,551	34,015	+ 1,204
OCT 1 - OCT 31	1,750	1,312	437	34,806	33,825	+ 672
NOV 1 - NOV 30	5,550	2,775	2,775	-	-	+ 2,870
DEC 1 - DEC 31	3,717	1,858	1,858	-	-	+ 1,858
TOTALS	104,333	68,463	35,870	339,997	261,525	+35,168

[1]All values are conversions of data from Table 2. Totals and shares may not add or subtract exactly as a result of rounding.

SOUTHERN TRIBUTARIES OF THE MILK RIVER

Division of the waters of the southern tributaries of the Milk River is not clearly defined in the Order of the International Joint Commission, dated October 4, 1921. At its executive session on December 8, 1986, the Commission agreed, in principle, that the issue of the utilization of the southern tributaries should be addressed in an informal, pragmatic manner. Accordingly, the Commission instructed the Accredited Officers to proceed with discussions with the goal of determining an early solution. To assist them in implementing the Commission's instructions, the Accredited Officers established a four-member ad hoc task force comprised of officials from the State of Montana and the Province of Alberta water management agencies, and United States and Canadian Field Representatives for the St. Mary-Milk River Treaty.

The task force commenced activities in the fall of 1987 with a tour of the basin and a meeting with a local member of the Montana State Legislature. In the spring of 1988, a meeting was held to inform ranchers of both countries of the formation and activities of the task force. In addition, a miscellaneous streamflow measurement program was conducted. During April 1988 an informal meeting was held in Washington, D.C. between some members of the task force and Commissioners Fulton and Totten and IJC engineering and legal advisors. At this meeting the fourth status report of the Accredited Officers and the activity schedule of the task force were discussed.

During March 1989 another public information meeting was held in Canada to further update ranchers on the progress and future activities of the task force. It was decided to continue the

miscellaneous streamflow measurement program during 1989, and to initiate a groundwater study by the USGS.

Additionally, Commissioners Fulton and Totten, Canadian IJC staff and the task force members visited various ranchers at the end of August 1989. Based on this visit, a revised work plan for the period October 1989 to September 1990 was prepared and submitted to the IJC for information. The task force members decided to discontinue formal meetings with ranchers during 1990 because it was believed they were of limited value. A new hydrometric station will be added in early 1990 on Breed Creek near the International Boundary in order to better monitor flows on this tributary.

EASTERN TRIBUTARIES OF THE MILK RIVER

The waters of the eastern tributaries of the Milk River are divided in accordance with the Order of the International Joint Commission, dated October 4, 1921, which stipulates under Rule III that "The natural flow of the eastern (otherwise known as the Saskatchewan or northern) tributaries of the Milk River at the points where they cross the International Boundary shall be divided equally between the two countries." This order might well be interpreted as requiring that the division of water be made on a continuing basis; however, the physical limitation due to transit time in the flow system was recognized. Further analysis showed that the minimum practical time frame for compilation of the natural flows at the International Boundary was every 10 days.

Prior to 1937, Canadian use along the eastern tributaries consisted of domestic irrigation, and the Canadian share of the natural flow was not fully used. In the late 1930s, the Government of Canada constructed three dams on the Frenchman River creating: Eastend Reservoir (station 11AC055), Huff Lake (station 11AC063), and Newton Lake (station 11AC056) and subsequently an operational division of flow on this tributary became necessary by 1937. In 1938, dams were constructed at both ends of Cypress Lake (station 11AC037) near the Battle Creek-Frenchman River divide to allow interbasin storage and transfers of water. In the early 1950s the redevelopment of several private irrigation projects and the construction of the Vidora Irrigation Project resulted in increased use of Battle Creek water in Canada and made an operational division of flow on this tributary necessary by 1957. In 1960, construction of Altawan Reservoir (station 11AB089) and the Spangler Irrigation Project

on Lodge Creek made an operational division of flow on this tributary necessary by 1961.

During the period March 1 to October 31, ten-day computations of the natural flow of Lodge Creek, Battle Creek and the Frenchman River are made to determine each country's share. If use by Canada is in excess of its share, then a delivery of an equivalent quantity of water is made to the United States at the earliest opportunity. During some years, the United States may request that delivery of deficit water be delayed to allow more efficient use by United States' irrigators. Canada may honour this request if no flow regulation problems are anticipated by delaying the delivery of water to refund the deficit.

Regular interim reports on the progress of the division of the natural flows of Lodge Creek, Battle Creek, and Frenchman River at the International Boundary are distributed to interested agencies during the irrigation season. Generally, no division of flow is made during the winter as flow and use are low and streamflow records are impractical to obtain.

Lyons Creek is monitored but does not have sufficient use in Canada at this time to warrant an operational division of flow. No flow was recorded on this tributary from March 1 to October 31, 1989.

A review of water rights licenses on Lyons Creek and the other presently non-apportioned eastern tributaries (Whitewater Creek, Rock Creek, Horse Creek, East Fork Battle Creek, Woodpile Coulee, and McEachern Creek) was conducted in 1989. This is in accordance with the decision made at the February 1, 1989 meeting of the Field Representatives which decided to review the licences each year Saskatchewan hosts the conference. It was determined

that water uses in these basins were such that operational division of flow was still not required.

Usage figures for unmeasured diversions to private irrigation projects in the Lodge Creek, Battle Creek, and Frenchman River basins in Saskatchewan were based on year-end reports provided by the Saskatchewan Water Corporation, and for the Lodge Creek and Battle Creek basins in Alberta, by Alberta Environment. These reports are compiled from reports received from operators of irrigation projects and from on-site inspections. An additional adjustment is made for domestic projects in the Battle Creek and Frenchman River basins based on the results of studies conducted by Canada on domestic use.

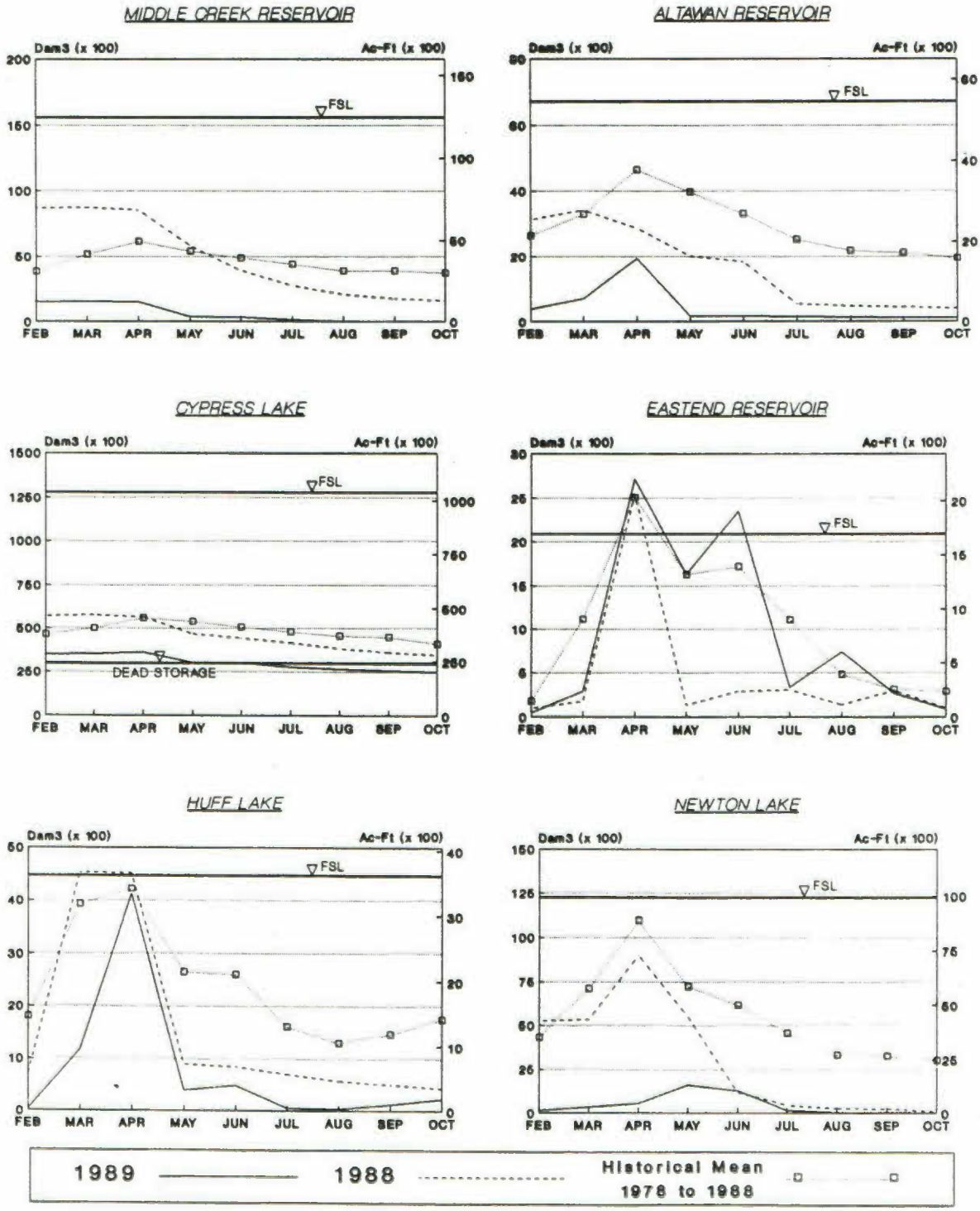
For the interim reports prepared at the end of division periods, estimates of minor diversion use were made based on a correlation between annual natural flows and reported use for previous years. The total natural flow for the current year was derived from computed natural flow to date, plus an estimate of runoff volume for the rest of the year, dependent on runoff conditions. At mid-year and at year-end, estimates of minor diversions were updated based on usage reports received from Alberta Environment and the Saskatchewan Water Corporation. Consequently, some discrepancy exists between interim and final division computations. Lists of reported diversions are contained in Appendix B.

The effects of the severe drought of 1988 continued into 1989. Despite near normal winter precipitation, the extremely dry antecedent conditions from the fall of 1988 and a slow spring melt resulted in little runoff. Fortunately, normal to above normal precipitation during the irrigation season resulted in good growing conditions.

At the end of February, the combined usable storage of the six major Canadian reservoirs was 7 120 dam^3 (5,770 acre-feet), or 5 per cent of the total usable storage of 139 000 dam^3 (113,000 acre-feet). By the end of April, spring flows had increased the usable storage to 12 per cent of the total. By the end of October, irrigation usage, evaporation, and releases from the reservoirs depleted the usable storage to 413 dam^3 (335 acre-feet) or less than 1 per cent of the total. Further details on storage in the major Canadian reservoirs are provided in Figure 1, and in Table 16, Appendix B.

FIGURE 1

RESERVOIRS IN LODGE, BATTLE AND FRENCHMAN BASINS
MONTH-END CONTENTS



FSL: Full Supply Level

LODGE CREEK

The computed natural flow of Lodge Creek at the International Boundary from March 1 to October 31, 1989, was 4 160 dam^3 (3,370 acre-feet) or 12 per cent of the average natural flow of the previous 39 years of record. Each country is entitled to 50 per cent of the natural flow or 2 080 dam^3 (1,690 acre-feet). A total flow of 1 920 dam^3 (1,560 acre-feet) was recorded at Lodge Creek below McRae Creek at International Boundary (station 11AB083) from March 1 to October 31.

Deficit deliveries were recorded in 9 of the 24 division periods during the season. A deficit of 180 dam^3 (146 acre-feet) remained at the end of October.

There was no return flow at Squaw Coulee near Willow Creek (station 11AB103) from the 515 dam^3 (418 acre-feet) diverted from Lodge Creek by Spangler Ditch (station 11AB060).

The division of the Lodge Creek natural flow is summarized in Tables 3 and 3A which follow. The detailed computation of the natural flow is given in Table 10 and the historical summary in Table 11 of Appendix A.

TABLE 3

SUMMARY OF LODGE CREEK DIVISION FOR 1989**

QUANTITIES IN CUBIC DECAMETRES

DIVISION PERIOD AT INTERNATIONAL BOUNDARY	NATURAL FLOW	U.S.A. SHARE	RECEIVED BY U.S.A.	RECEIVED BY U.S.A.	
				ABOVE SHARE	BELOW SHARE
MAR 1 - MAR 10	0	0	0	0	
MAR 11 - MAR 20	0	0	0	0	
MAR 21 - MAR 31	372	186	221	35	
APR 1 - APR 10	1 782	891	198		693
APR 11 - APR 20	577	289	3		286
APR 21 - APR 30	483	241	1		240
MAY 1 - MAY 10	30	15	0		15
MAY 11 - MAY 20	119	60	1 116	1 056	
MAY 21 - MAY 31	0	0	90	90	
JUN 1 - JUN 10	368	184	7		177
JUN 11 - JUN 20	159	80	276	196	
JUN 21 - JUN 30	185	93	5		88
JUL 1 - JUL 10	4	2	0		2
JUL 11 - JUL 20	0	0	0	0	
JUL 21 - JUL 31	0	0	0	0	
AUG 1 - AUG 10	33	17	0		17
AUG 11 - AUG 20	39	20	0	0	
AUG 21 - AUG 31	13	7	0		7
SEP 1 - SEP 10	0	0	0	0	
SEP 11 - SEP 20	0	0	0	0	
SEP 21 - SEP 30	0	0	0	0	
OCT 1 - OCT 10	0	0	0	0	
OCT 11 - OCT 20	0	0	0	0	
OCT 21 - OCT 31	0	0	0	0	
TOTAL	4 164	2 082	1 917		

** This is a summary of data from Table 10, Appendix A.

TABLE 3A

SUMMARY OF LODGE CREEK DIVISION FOR 1989**

QUANTITIES IN ACRE-FEET

DIVISION PERIOD AT INTERNATIONAL BOUNDARY	NATURAL FLOW	U.S.A. SHARE	RECEIVED BY U.S.A.	RECEIVED BY U.S.A.	
				ABOVE SHARE	BELOW SHARE
MAR 1 - MAR 10	0	0	0	0	
MAR 11 - MAR 20	0	0	0	0	
MAR 21 - MAR 31	302	151	179	28	
APR 1 - APR 10	1,445	722	161		562
APR 11 - APR 20	468	234	2		232
APR 21 - APR 30	392	195	1		195
MAY 1 - MAY 10	24	12	0		12
MAY 11 - MAY 20	96	49	905	856	
MAY 21 - MAY 31	0	0	73	73	
JUN 1 - JUN 10	298	149	6		143
JUN 11 - JUN 20	129	65	224	159	
JUN 21 - JUN 30	150	75	4		71
JUL 1 - JUL 10	3	2	0		2
JUL 11 - JUL 20	0	0	0	0	
JUL 21 - JUL 31	0	0	0	0	
AUG 1 - AUG 10	27	14	0		14
AUG 11 - AUG 20	32	16	0	0	
AUG 21 - AUG 31	11	6	0		6
SEP 1 - SEP 10	0	0	0	0	
SEP 11 - SEP 20	0	0	0	0	
SEP 21 - SEP 30	0	0	0	0	
OCT 1 - OCT 10	0	0	0	0	
OCT 11 - OCT 20	0	0	0	0	
OCT 21 - OCT 31	0	0	0	0	
TOTAL	3,376	1,688	1,554		

** All values are conversion of data from Table 3.
Totals and shares may not add or subtract exactly as a result of rounding.

BATTLE CREEK

The computed natural flow of Battle Creek at the International Boundary from March 1 to October 31, 1989, was 8 590 dam^3 (6,960 acre-feet) or 27 per cent of the average natural flow of the previous 49 years of record. Each country is entitled to 50 per cent of the natural flow or 4 300 dam^3 (3,490 acre-feet). A total flow of 5 080 dam^3 (4,120 acre-feet) was recorded at Battle Creek at International Boundary (station 11AB027) from March 1 to October 31.

Deficit deliveries were recorded in 7 of the 24 division periods during the season. All deficits were satisfactorily refunded.

The accumulated affect of several years of below normal spring runoff resulted in much below normal levels in Cypress Lake. In 1989, all required water for irrigation on Battle Creek was pumped out of Cypress Lake.

A return flow of 35 per cent of diversion, based on a 1972-76 study, was used for the Gaff Ditch diversion from Battle Creek. The recorded flow at Gaff Ditch near Merryflat from March 1 to October 31, 1989, was 1 420 dam^3 (1,150 acre-feet), resulting in a return flow of 497 dam^3 (403 acre-feet). During the irrigation period, the return flow was computed to be 23 per cent for Vidora, Richardson, and McKinnon ditches. Return flow computations for Nashlyn Canal were rendered invalid by local rainfall. Consequently, the normal return flow value of 25 per cent was used.

The division of the Battle Creek natural flow is summarized in Tables 4 and 4A which follow. The detailed computation of the

natural flow is given in Table 12 and the historical summary in Table 13 of Appendix A.

TABLE 4

SUMMARY OF BATTLE CREEK DIVISION FOR 1989**

QUANTITIES IN CUBIC DECAMETRES

DIVISION PERIOD AT INTERNATIONAL BOUNDARY	NATURAL FLOW	U.S.A. SHARE	RECEIVED BY U.S.A.	RECEIVED BY U.S.A.	
				ABOVE SHARE	BELOW SHARE
MAR 1 - MAR 14	5	3	5	2	
MAR 15 - MAR 25	11	6	0		6
MAR 26 - APR 4	763	382	677	295	
APR 5 - APR 14	1 233	617	447		170
APR 15 - APR 24	1 281	641	628		13
APR 25 - MAY 4	1 077	539	622	83	
MAY 5 - MAY 14	323	162	130		32
MAY 15 - MAY 25	288	144	34		110
MAY 26 - JUN 4	730	365	700	335	
JUN 5 - JUN 14	946	473	484	11	
JUN 15 - JUN 24	756	378	378	0	
JUN 25 - JUL 4	375	188	216	28	
JUL 5 - JUL 14	116	58	113	55	
JUL 15 - JUL 25	86	43	82	39	
JUL 26 - AUG 4	34	17	32	15	
AUG 5 - AUG 14	6	3	3	0	
AUG 15 - AUG 25	3	2	0		2
AUG 26 - SEP 4	4	2	0		2
SEP 5 - SEP 14	44	22	40	18	
SEP 15 - SEP 24	97	49	94	45	
SEP 25 - OCT 4	60	30	57	27	
OCT 5 - OCT 14	85	43	82	39	
OCT 15 - OCT 25	154	77	151	74	
OCT 26 - OCT 31	113	57	110	53	
TOTAL	8 590	4 301	5 085		

** This is a summary of data from Table 12, Appendix A.

TABLE 4A

SUMMARY OF BATTLE CREEK DIVISION FOR 1989**

QUANTITIES IN ACRE-FEET

DIVISION PERIOD AT INTERNATIONAL BOUNDARY	NATURAL FLOW	U.S.A. SHARE	RECEIVED BY U.S.A.	RECEIVED BY U.S.A.	
				ABOVE SHARE	BELOW SHARE
MAR 1 - MAR 14	4	2	4	2	
MAR 15 - MAR 25	9	5	0		5
MAR 26 - APR 4	619	310	549	239	
APR 5 - APR 14	1,000	500	362		138
APR 15 - APR 24	1,039	520	509		11
APR 25 - MAY 4	873	437	504	67	
MAY 5 - MAY 14	262	131	105		26
MAY 15 - MAY 25	233	117	28		89
MAY 26 - JUN 4	592	296	567	272	
JUN 5 - JUN 14	767	383	392	9	
JUN 15 - JUN 24	613	306	306	0	
JUN 25 - JUL 4	304	152	175	23	
JUL 5 - JUL 14	94	47	92	45	
JUL 15 - JUL 25	70	35	66	32	
JUL 26 - AUG 4	28	14	26	12	
AUG 5 - AUG 14	5	2	2	0	
AUG 15 - AUG 25	2	2	0		2
AUG 26 - SEP 4	3	2	0		2
SEP 5 - SEP 14	36	18	32	15	
SEP 15 - SEP 24	79	40	76	36	
SEP 25 - OCT 4	49	24	46	22	
OCT 5 - OCT 14	69	35	66	32	
OCT 15 - OCT 25	125	62	122	60	
OCT 26 - OCT 31	92	46	89	43	
TOTAL	6,964	3,487	4,122		

** All values are conversions of data from Table 4.
Totals and shares may not add or subtract exactly as a result of rounding.

FRENCHMAN RIVER

The computed natural flow of the Frenchman River at the International Boundary from March 1 to October 31, 1989, was 22 800 dam^3 (18,500 acre-feet) or 28 per cent of the average natural flow of the previous 49 years of record. Each country is entitled to 50 per cent of the natural flow or 11 400 dam^3 (9,240 acre-feet). A total flow of 12 000 dam^3 (9,730 acre-feet) was recorded at Frenchman River at International Boundary (station 11AC041) from March 1 to October 31.

The below normal spring runoff resulted in little storage in Newton Lake. Consequently, there was no diversion to Newton Lake Main Canal for the first time since construction of the canal in the early 1940s. Diversions to other irrigation projects in the Val Marie area were, in general, far below normal.

Deficit deliveries were recorded in 10 of the 24 division periods during the season. At the end of October, interim computations showed a deficit of 299 dam^3 (242 acre-feet) whereas final computations produced an actual deficit of 433 dam^3 (351 acre-feet). The discrepancy between the interim and the final computations was primarily a result of a difference of 534 dam^3 (433 acre-feet) in the computed volume at the International Boundary.

A request was made by Canada in September to forego releases to allow repairs to the irrigation canal intakes and outlet structures on Huff Lake. Following the repairs, releases were made in late September and early October to fill in-channel pools for winter stock-watering purposes.

The four periods from September 21 to October 31 were combined into one period. This was done to eliminate discrepancies in the natural flow calculations that would have occurred as a result of unusual in-channel storage conditions which slowed a release from Newton Lake.

The division of the Frenchman River natural flow is summarized in Tables 5 and 5A, which follow. The detailed computation of the natural flow is given in Table 14 and the historical summary in Table 15 of Appendix A.

TABLE 5

SUMMARY OF FRENCHMAN RIVER DIVISION FOR 1989**

QUANTITIES IN CUBIC DECAMETRES

DIVISION PERIOD AT INTERNATIONAL BOUNDARY	NATURAL FLOW	U.S.A. SHARE	RECEIVED BY U.S.A.	RECEIVED BY U.S.A.	
				ABOVE SHARE	BELOW SHARE
MAR 1 - MAR 10	64	32	13		19
MAR 11 - MAR 20	187	94	172	78	
MAR 21 - MAR 31	3 277	1 639	2 730	1 091	
APR 1 - APR 10	4 449	2 225	1 923		302
APR 11 - APR 20	2 715	1 358	73		1 285
APR 21 - APR 30	1 827	914	12		902
MAY 1 - MAY 10	1 302	651	24		627
MAY 11 - MAY 20	626	313	65		248
MAY 21 - MAY 31	803	402	254		148
JUN 1 - JUN 10	2 377	1 189	1 409	220	
JUN 11 - JUN 20	2 185	1 093	1 831	738	
JUN 21 - JUN 30	1 266	633	1 246	613	
JUL 1 - JUL 10	282	141	875	734	
JUL 11 - JUL 20	626	313	1 081	768	
JUL 21 - JUL 31	154	77	90	13	
AUG 1 - AUG 10	112	56	0		56
AUG 11 - AUG 20	17	9	0		9
AUG 21 - AUG 31	0	0	0	0	
SEP 1 - SEP 10	257	129	0		129
SEP 11 - SEP 20	0	0	0	0	
SEP 21 - SEP 30 OCT 1 - OCT 10 Periods OCT 11 - OCT 20 Combined OCT 21 - OCT 31	78	39	226	187	
TOTAL	22 761	11 386	12 024		

** This is a summary of data from Table 14, Appendix A.

TABLE 5A

SUMMARY OF FRENCHMAN RIVER DIVISION FOR 1989**

QUANTITIES IN ACRE-FEET

DIVISION PERIOD AT INTERNATIONAL BOUNDARY	NATURAL FLOW	U.S.A. SHARE	RECEIVED BY U.S.A.	RECEIVED BY U.S.A.	
				ABOVE SHARE	BELOW SHARE
MAR 1 - MAR 10	52	26	11		15
MAR 11 - MAR 20	152	76	139	63	
MAR 21 - MAR 31	2,657	1,329	2,213	884	
APR 1 - APR 10	3,607	1,804	1,559		245
APR 11 - APR 20	2,201	1,101	59		1,042
APR 21 - APR 30	1,481	741	10		731
MAY 1 - MAY 10	1,056	528	19		508
MAY 11 - MAY 20	507	254	53		201
MAY 21 - MAY 31	651	326	206		120
JUN 1 - JUN 10	1,927	964	1,142	178	
JUN 11 - JUN 20	1,771	886	1,484	598	
JUN 21 - JUN 30	1,026	513	1,010	497	
JUL 1 - JUL 10	229	114	709	595	
JUL 11 - JUL 20	507	254	876	623	
JUL 21 - JUL 31	125	62	73	11	
AUG 1 - AUG 10	91	45	0		45
AUG 11 - AUG 20	14	7	0		7
AUG 21 - AUG 31	0	0	0	0	
SEP 1 - SEP 10	208	105	0		105
SEP 11 - SEP 20	0	0	0	0	
SEP 21 - SEP 30 OCT 1 - OCT 10 Periods OCT 11 - OCT 20 Combined OCT 21 - OCT 31	63	32	183	152	
TOTAL	18,452	9,231	9,748		

** All values are conversions of data from Table 5.
Totals and shares may not add or subtract exactly as a result of rounding.

ANNEX A

TREATY BETWEEN THE UNITED STATES AND GREAT BRITAIN RELATING TO BOUNDARY WATERS, AND QUESTIONS ARISING BETWEEN THE UNITED STATES AND CANADA - ARTICLE VI

INTERNATIONAL JOINT COMMISSION
1921 Order

TREATY
BETWEEN THE UNITED STATES AND GREAT BRITAIN RELATING TO BOUNDARY WATERS, AND QUESTIONS ARISING BETWEEN THE UNITED STATES AND CANADA

ARTICLE VI

The High Contracting Parties agree that the St. Mary and Milk Rivers and their tributaries (in the State of Montana and the Provinces of Alberta and Saskatchewan) are to be treated as one stream for the purposes of irrigation and power, and the waters thereof shall be apportioned equally between the two countries, but in making such equal apportionment more than half may be taken from one river and less than half from the other by either country so as to afford a more beneficial use to each. It is further agreed that in the division of such waters during the irrigation season, between the 1st of April and 31st of October, inclusive, annually, the United States is entitled to a prior appropriation of 500 cubic feet per second of the waters of the Milk River, or so much of such amount as constitutes three-fourths of its natural flow, and that Canada is entitled to a prior appropriation of 500 cubic feet per second of the flow of St. Mary River, or so much of such amount as constitutes three-fourths of its natural flow.

The Channel of the Milk River in Canada may be used at the convenience of the United States for the conveyance, while passing through Canadian territory, of waters diverted from the St. Mary River. The provisions of Article II of this treaty shall apply to any injury resulting to property in Canada from the conveyance of such waters through the Milk River.

The measurement and apportionment of the water to be used by each country shall from time to time be made jointly by the properly constituted reclamation officers of the United States and the properly constituted irrigation officers of His Majesty under the direction of the International Joint Commission.

INTERNATIONAL JOINT COMMISSION

ORDER

IN THE MATTER OF THE MEASUREMENT AND APPORTIONMENT OF THE WATERS OF THE ST. MARY AND MILK RIVERS AND THEIR TRIBUTARIES IN THE STATE OF MONTANA AND THE PROVINCES OF ALBERTA AND SASKATCHEWAN.

Whereas by Article VI of the Treaty entered into between the United States of America and His Majesty, the King of the United Kingdom Great Britain and Ireland and of the British Dominions beyond the Seas, Emperor of India, signed at Washington on the 11th of January, 1909;

And whereas, the said Reclamation and Irrigation Officers have been unable to agree as to the manner in which the waters mentioned in the said Article VI should be measured and apportioned;

And whereas, before giving directions as to the measurement and apportionment of the said waters, the International Joint Commission deemed it proper to hear such representations and suggestions thereon as the Governments of the United States and Canada, the Provinces of Alberta and Saskatchewan, and the State of Montana, and as corporations and persons interested might see fit to make, and for such purposes sittings of the Commission were held at the following times and places: At the city of St. Paul, in the State of Minnesota, on the 24th, 25th, 26th, 27th, and 28th days of May, 1915; at the city of Detroit, in the State of Michigan, on the 15th, 16th, and 17th days of May, 1917; at the city of Ottawa, in the Province of Ontario, on the 3rd, 4th, and 5th days of May, 1920; at the village of Chinook, in the State of Montana, on the 15th day of September, 1921; and at the city of Lethbridge, in the Province of Alberta, on the 17th day of September, 1921, when counsel and representatives of the said Governments, corporations, and persons appeared and presented their views;

And whereas, pending final decision as to the proper method of measuring and apportioning said waters, interim orders with reference thereto have been made by the International Joint Commission from time to time, the last of such orders bearing the date of 5th day of April, 1921;

And whereas the members of the International Joint Commission have unanimously determined that the said Reclamation and Irrigation Officers should be guided in the measurement and apportionment of said waters by the directions and instructions hereinafter set forth;

IT IS THEREFORE ORDERED AND DIRECTED by the Commission in pursuance of the powers conferred by the said Article VI of the said Treaty that the Reclamation and Irrigation Officers of the United States and Canada shall, until this order is varied, modified, or withdrawn by the Commission, make jointly the measurement and apportionment of the water to be used by the United States and Canada in accordance with the following rules:

St. Mary River

I. (a) During the irrigation season when the natural flow of the St. Mary River at the point where it crosses the international boundary is six hundred and sixty-six (666) cubic feet per second or less Canada shall be entitled to three-fourths and the United States to one-fourth of such flow.

(b) During the irrigation season when the natural flow of the St. Mary River at the point where it crosses the international boundary is more then six hundred and sixty-six (666) cubic feet per second Canada shall be entitled to a prior appropriation of five hundred (500) cubic feet per second, and the excess over six hundred and sixty-six (666) cubic feet per second shall be divided equally between the two countries.

(c) During the non-irrigation season the natural flow of the St. Mary River at the point where it crosses the international boundary shall be divided equally between the two countries.

Milk River

II. (a) During the irrigation season when the natural flow of the Milk River at the point where it crosses the international boundary for the last time (commonly and hereafter called the Eastern Crossing) is six hundred and sixty-six (666) cubic feet per second or less, the United States shall be entitled to three-fourths and Canada to one-fourth of such natural flow.

(b) During the irrigation season when the natural flow of the Milk River at the Eastern Crossing is more then six hundred and sixty-six (666) cubic feet per second the United States shall be entitled to a prior appropriation of five hundred (500) cubic feet per second and the excess over six hundred and sixty-six (666) cubic feet per second shall be divided equally between the two countries.

(c) During the non-irrigation season the natural flow of the Milk River at the Eastern Crossing shall be divided equally between the two countries.

Eastern Tributaries of Milk River

III. The natural flow of the eastern (otherwise known as the Saskatchewan or northern) tributaries of the Milk River at the points where they cross the international boundary shall be divided equally between the two countries.

Waters not naturally crossing the boundary

IV. Each country shall be apportioned such waters of the said rivers and of any tributaries therof as rise in that country but do not naturally flow across the international boundary.

V. For the purpose of carrying out the apportionment directed in Paragraphs I, II, and III hereof the said Reclamation and Irrigation Officers shall jointly take steps:

(a) To ascertain and keep daily record of the natural flow of the St. Mary River at the international boundary, of the Milk River at the Eastern Crossing, and of the eastern tributaries of the Milk River at the international boundary by measurement in each case:

(1) At the gauging station at the international boundary;

(2) At all places where any of the waters which would naturally flow across the international boundary at that particular point are diverted in either country prior to such crossing;

(3) At all places where any of the waters which would naturally flow across the international boundary at that particular point are stored, or the natural flow thereof increased or decreased prior to such crossing.

(b) To fix the amount of water to which each country is entitled in each case by applying the directions contained in paragraphs 1, 2, and 3 hereof to the total amount of the natural flow so ascertained in each case.

(c) To communicate the amount so fixed to all parties interested, so that the apportionment of the said waters may be fully carried out by both countries in accordance with the said directions.

VI. Each country may receive its share of the said waters as so fixed at such point or points as it may desire. A gauging station shall be established and maintained by the Reclamation

or Irrigation Officers of the country in which any diversion, storage, increase or decrease of the natural flow shall be made at every point where such diversion, storage, increase, or decrease takes place.

VII. International gauging stations shall be maintained at the following points:

St. Mary River near international boundary; the north branch of Milk River near international boundary; the south branch of Milk River near international boundary; Milk River at Eastern Crossing; Lodge Creek, Battle Creek, and Frenchman River, near international boundary; and gauging stations shall be established and maintained at such other points as the Commission may from time to time approve.

VIII. The said Reclamation and Irrigation Officers are hereby further authorized and directed:

(a) To make such additional measurements and to take such further and other steps as may be necessary or advisable in order to insure the apportionment of the said waters in accordance with the directions herein set forth.

(b) To operate the irrigation works of either country in such a manner as to facilitate the use by the other country of its share of the said waters and subject hereto to secure to the two countries the greatest beneficial use thereof.

(c) To report to the Commission the measurements made at all international and other gauging stations established pursuant to this order.

IX. In the event of any disagreement in respect to any matter or thing to be done under this order the said Reclamation and Irrigation Officers shall report to the Commission, setting forth fully the points of difference and the facts relating thereto.

X. The said order of the Commission, dated the 6th day of April 1921, is hereby withdrawn, except with respect to the report to be furnished to the Commission thereunder.

Dated at Ottawa, Canada, this 4th day of October, 1921.

O. GARDNER,
C.A. MACGRATH,
C.D. CLARK,
HENRY A. POWELL,
W.H. HEARST,
MARK A. SMITH.

ANNEX B

International System of Units

(SI) Conversions

WSC - USGS DIVISION

INCH-POUND TO INTERNATIONAL SYSTEM OF UNITS (SI) CONVERSION

Since 1975, the Report to the International Joint commission on the Division of the Waters of the St. Mary and Milk Rivers has used dual units (SI and inch-pound).

The two inch-pound units that were used in previous reports were cfs-days and acre-feet.

1 cfs-day = 86,400 cubic feet

1 acre-foot = 43,560 cubic feet

1 cfs-day = 1.9835 acre-feet

The SI unit replacing the inch-pound units is the cubic decametre(dam^3).

1 dam^3 = 1000 cubic metres

1 cubic metre = 35.315 cubic feet

1 dam^3 = 35,315 cubic feet

1 acre-foot = 1.2335 dam^3

1 cfs-day = 2.4466 dam^3

1 dam^3 = 0.8107 acre-foot

ANNEX C

List of Gauging Stations

INTERNATIONAL GAUGING STATIONS OPERATED JOINTLY BY THE UNITED STATES AND CANADA ST. MARY AND MILK RIVER DRAINAGE BASINS 1989

Map Index	Station Name
	ST. MARY RIVER BASIN
05AE027	St. Mary River at International Boundary
05AE029	St. Mary Canal at St. Mary Crossing near Babb, Montana
05AE033	Swiftcurrent Creek at Sherburne, Montana
05AE036	Lake Sherburne at Sherburne, Montana
	MILK RIVER BASIN
11AA001	North Milk River near International Boundary
11AA005	Milk River at Milk River
11AA025	Milk River at Western Crossing of International Boundary
11AA031	Milk River at Eastern Crossing of International Boundary
11AA032	North Fork Milk river above St. Mary Canal near Browning, Montana.
11AA033	South Fork Milk River near Babb, Montana
AA11038	Verdigris Coulee near the Mouth
	LODGE CREEK TRIBUTARY BASIN
11AB008	Middle Creek above Lodge Creek
11AB001	Middle Creek below Middle Creek Reservoir
11AB108	Middle Creek near Govenlock
11AB009	Middle Creek near Saskatchewan Boundary
11AB060	Spangler Ditch near Govenlock
11AB080	Middle Creek Reservoir
11AB083	Lodge Creek below McRae Creek at International Boundary
11AB089	Altawan Reservoir near Govenlock

BATTLE CREEK TRIBUTARY BASIN

11AB018	Nashlyn Canal near Consul
11AB027	Battle Creek at International Boundary
11AB044	McKinnon Ditch near Consul
11AB058	Richardson Ditch near Consul
11AB075	Lyons Creek at International Boundary
11AB077	Cypress Lake West Outflow Canal
11AB078	Cypress Lake West Inflow Canal
11AB084	Vidora Ditch near Consul
11AB085	Cypress Lake West Inflow Canal Drain
11AB102	Gaff Ditch near Merryflat

FRENCHMAN RIVER TRIBUTARY BASIN

11AC001	Frenchman River below Eastend Reservoir
11AC037	Cypress Lake
11AC041	Frenchman River at International Boundary
11AC052	Eastend Canal near Eastend
11AC054	Newton Lake Main Canal
11AC055	Eastend Reservoir
11AC056	Newton Lake
11AC060	Cypress Lake East Outflow Canal
11AC062	Frenchman River below Newton Lake
11AC063	Huff Lake
11AC064	Belanger Creek Diversion to Cypress Lake
11AC065	Huff Lake Gravity Canal
11AC066	Huff Lake Pumping Canal

GAUGING STATIONS OPERATED INDEPENDENTLY BY EITHER THE UNITED STATES OR CANADA IN THE ST. MARY AND MILK RIVER DRAINAGE BASINS 1989

Map Index	Station Name	Operated by
	ST. MARY RIVER BASIN	
5-0145*	Swiftcurrent Creek at Many Glacier, Montana	U.S.A.
5-0175*	St. Mary River near Babb, Montana	U.S.A.
	MILK RIVER BASIN	
11AA028*	Bear Creek near International Boundary	Canada
11AA029*	Miners Coulee near International Boundary	Canada
	LODGE CREEK TRIBUTARY BASIN	
11AB082*	Lodge Creek at Alberta Boundary	Canada
11AB091	Michel Reservoir near Elkwater	Canada
11AB092	Greasewood Reservoir near Elkwater	Canada
11AB094	Bare Creek Reservoir near Elkwater	Canada
11AB097	Cressday Reservoir near Cressday	Canada
11AB098	Jaydot Reservoir near Jaydot	Canada
11AB099	Mitchell Reservoir near Elkwater	Canada
11AB103	Squaw Coulee near Willow Creek	Canada
11AB104	Massy Reservoir near Elkwater	Canada
11AB114	Middle Creek Reservoir Bedford Outlet	Canada
11AB115	Middle Creek Reservoir Flood Spillway	Canada

* Data not included in this report or appendices

BATTLE CREEK TRIBUTARY BASIN

11AB020*	Shepherd Ditch near Consul	Canada
11AB090	Reesor Reservoir near Elkwater	Canada
11AB095	Adams Lake	Canada
11AB096*	Battle Creek near Consul	Canada
11AB101*	Battle Creek below Nashlyn Project	Canada
11AB117*	Battle Creek at Alberta Boundary	Canada
11AB18*	Battle Creek below Wilson's Weir	Canada

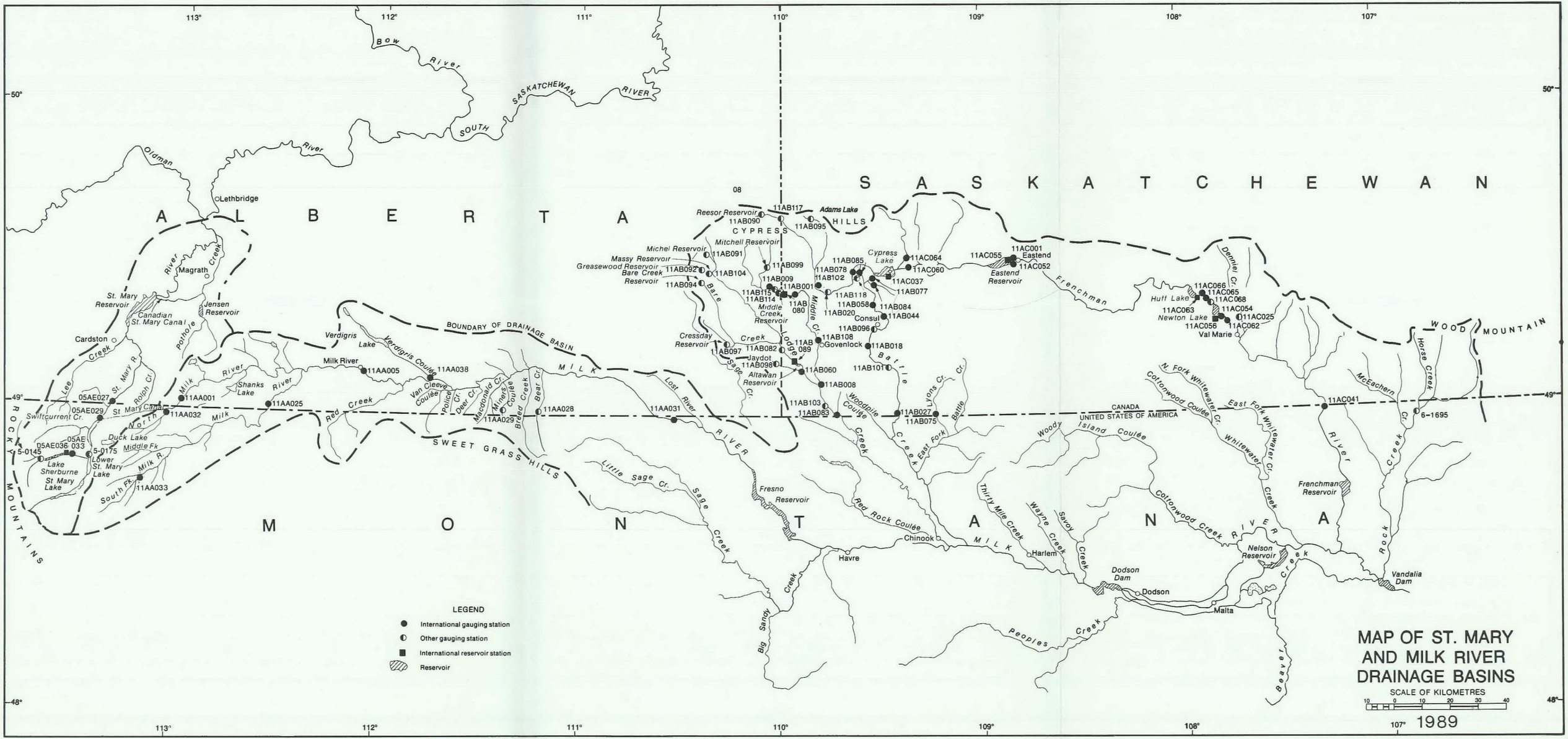
FRENCHMAN RIVER TRIBUTARY BASIN

11AC023*	Frenchman River at 50-Mile	Canada
11AC025*	Denniel Creek near Val Marie	Canada
11AC051*	Frenchman River below Val Marie	Canada
11AC068	Val Marie Pump No. 1	Canada
11AC073	Denniel Creek East Tributary	Canada

ROCK CREEK TRIBUTARY BASIN

6-1695*	Rock Creek below Horse Creek near International Boundary	U.S.A.

* Data not included in this report or appendices


MAP OF ST. MARY AND MILK RIVER DRAINAGE BASINS
SCALE OF KILOMETRES
10 0 10 20 30 40
1989
LEGEND
International gauging station
Other gauging station
International reservoir station
Reservoir
BOUNDARY OF DRAINAGE BASIN
CANADA
UNITED STATES OF AMERICA
ALBERTA
SASKATCHEWAN
MONTANA
ROCKY MOUNTAINS
SWEET GRASS HILLS
CYPRESS HILLS
WOOD MOUNTAIN
Lethbridge
Cardston
Magrath
Milk River
Chinook
Havre
Harlem
Malta
Dodson
Val Marie
Govenlock
Consul
Eastend
Frenchman
Milk River
St. Mary River
Oldman River
South Saskatchewan River
Bow River
Lost River
Sage Creek
Big Sandy Creek
Peoples Creek
Beaver Creek
Rock Creek
Cottonwood Creek
Whitewater Creek
Woody Island Coulée
Red Rock Coulée
Thirty Mile Creek
Wayne Creek
Savoy Creek
Lyons Creek
Battle Creek
Woodpile Coulée
Verdigris Coulée
Van Cleeve Coulée
Police Coulée
Deer Creek
Macdonald Creek
Miners Coulée
Bread Creek
Bear Creek
Red Creek
Lee Creek
Swiftcurrent Cr.
Duck Lake
Middle Fk
Lower St. Mary Lake
Lake Sherburne
St. Mary Lake
South Fk
Shanks Lake
Verdigris Lake
Pothole Creek
Canadian St. Mary Canal
St. Mary Reservoir
Jensen Reservoir
Milk River
North
Middle Creek Reservoir
Mitchell Reservoir
Reesor Reservoir
Adams Lake
Michel Reservoir
Massy Reservoir
Greasewood Reservoir
Bare Creek Reservoir
Cressday Reservoir
Jaydot
Altawan Reservoir
Lodge
Cypress Lake
Eastend Reservoir
Huff Lake
Newton Lake
Dennis Cr.
Horse Creek
McEachern Cr.
N. Fork Whitewater Cr.
East Fork Whitewater Cr.
Frenchman Reservoir
Nelson Reservoir
Dodson Dam
Vandalia Dam
Fresno Reservoir
Little Sage Cr.
08
05AE027
05AE029
05AE036
033
5-0145
5-0175
11AA001
11AA005
11AA025
11AA028
11AA029
11AA031
11AA032
11AA033
11AA038
11AB117
11AB090
11AB095
11AB091
11AB092
11AB104
11AB094
11AB099
11AB009
11AB001
11AB115
11AB114
11AB080
11AB085
11AB078
11AB102
11AB118
11AB058
11AB020
11AB084
11AB044
11AB096
11AB108
11AB089
11AB018
11AB082
11AB097
11AB098
11AB060
11AB101
11AB008
11AB103
11AB083
11AB027
11AB075
11AC064
11AC060
11AC037
11AC077
11AC055
11AC001
11AC052
11AC066
11AC065
11AC068
11AC054
11AC063
11AC056
11AC062
11AC025
11AC041
6-1695
48°
49°
50°
107°
108°
109°
110°
111°
112°
113°

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