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To:

The Honourable, the International Joint
Commission, Washington, D.C., and Ottawa,
Canada.

Gentlemen,

In compliance with the provisions of Clause
9 of your order of May 20th. 1918, directing the
division of the waters of the St. Mary and Milk
rivers between the United States and Canada, we
beg to submit the following report upon the
season's operations.

As it was impossible for the undersigned to
personally undertake the field work, Mr. B.E. Jones
was delegated to carry on these operations on be-
half of Mr. Davis, and Mr. R.J. Burley on behalf of
Mr. Drake. These two engineers, working together
under our supervision, carried on the work rendered
necessary by virtue of the order of the Commission
and investigated questions of mutual interest to
the Governments of the United States and Canada
and, presumably, of interest to the Commission.

It was decided that new joint gauging stations
would be necessary at the intake, at the St. Mary
crossing, and at the outlet of the St. Mary canal
of the United States Reclamation Service, in order
to facilitate the measurement and apportionment of

the waters of the two river systems.

The first work done, therefore, was the selection of sites for these stations which, after their installation, were operated as joint stations. These stations have been equipped with automatic water stage registers, although during the early part of the season these were not available, and they are now of the most modern type throughout, so that complete records can be obtained of the conditions of flow through this canal.

A new station site was also selected on Canyon creek, to measure the inflow into the Sherburne reservoir, and on the north branch of Milk river, above the outlet of the St. Mary canal, to measure the natural flow of this stream. These stations were installed and operated by the United States Geological Survey.

Before the opening of the field season complaints were received from Messrs. C.E. Remington and A.A. Humphrey of Masinasin, Alberta, that the waters of the St. Mary river, carried through the channel of Milk river, were causing damage, by

erosion, to lands owned by them. After a conference it was decided that such complaints should be investigated jointly by officers of the United States Reclamation Service and the Canadian Reclamation Service in order to determine the nature and extent of the damage, if any, with a view to facilitating an amicable settlement of the questions involved.

In accordance with this arrangement, Mr.G.E. Stratton, Project Manager, United States Reclamation Service, Milk River Project, and Mr.R.J.Burley of the Canadian Reclamation Service, inspected the lands with respect to which complaints were made and agreed as to the facts in each case. Agreements have now been reached between the U.S.Reclamation Service and the complainants and it is expected that the documents will be executed within a short time.

Arrangements were made that the undersigned should make a joint trip of inspection early in July over the districts affected by the order of the Commission but, unfortunately, other pressing engagements prevented Mr.Davis visiting the St.Mary-Milk River District. Later in July, however, Mr.F.H. Newell and Mr.Drake made a trip of inspection with Messrs.Jones and Burley over the principal irrigation

systems on Lodge and Battle creeks and the Frenchman river in Canada and in the lower Milk river valley in Montana, while both, at a later date, separately investigated conditions in the St. Mary river basin.

During the joint inspection trip, Mr. G. E. Stratton, United States Reclamation Service, W. B. Sands, Attorney for the Upper Milk River Water-users Association, and two members of this association, were met at Govenlock, Saskatchewan. These gentlemen were investigating conditions in Canada to ascertain to what extent, if any, water from Battle creek was being used for irrigation purposes in Canada and whether such use was depriving the water users on the lower course of the stream in Montana of their fair share of the flow. Their inspection satisfied them that the very small quantity of water being diverted by Canadian irrigators would have no appreciable effect upon the supply otherwise available to irrigators in Montana. A later investigation, August 13th and 14th, by Messrs. Jones and Burley confirmed this opinion and showed that, owing to the extremely dry season, the flow in Battle and Lodge creeks was so small as to be negligible in so far as irrigation interests in Montana were concerned.

During the early part of the season there was ample water available from St. Mary river to supply all requirements, but during the first half of June conditions along Milk river became more or less acute, owing to drought, resulting in a demand by the owners of the private canals in the lower Milk river valley for water diverted from the St. Mary. As a consequence of this the St. Mary canal of the United States Reclamation Service was operated at capacity during the latter part of June and practically the whole of July.

During the period July 27-29 there occurred a sudden and considerable drop in the discharge of the St. Mary river, which necessitated readjustment of the headgates of the St. Mary canal, in order that Canada might receive the supply to which it was entitled under the provisions of Clause 8 of the order of the Commission, dated 24th May, 1918.

On August 1st the Alberta Railway and Irrigation Company informed us that they were not receiving their full supply of water and an investigation was immediately made by the engineers in charge of the work. The records show that, due to the very rapid

fall in the river at this time, a little less than 500 second feet were received by Canada during the period July 29th to August 3rd. During this period the project manager of the United States Reclamation Service cut down his diversion from 400 to 240 second-feet before he was able to equalize the fall in the river. By August 4th, however, all the necessary adjustments had been made and the full supply to which Canada was entitled was again passing down the river.

It was arranged that the headgates of the United States Reclamation Service St. Mary canal should be so operated as to allow not less than 500 second feet to flow past the boundary until such time as the combined flow of the river and canal should fall below 667 second-feet, when the United States should take one-fourth of the total flow, allowing the remaining three-fourths to pass on down the river. The three-fourths clause came into effect during the last week in August when, as a consequence, the diversion by the United States Reclamation Service was reduced to less than 150 second-feet. During the month of August, however,

Canada received a mean flow of 509 second-feet and the United States a mean flow of 253 second-feet.

As Mr. Stratton expressed a wish late in August to get as much St. Mary water as possible during September in order to fill the Nelson reservoir, Mr. S. G. Porter, Superintendent of Operation and Maintenance of the the Alberta Railway and Irrigation Company, agreed, at our suggestion, to limit the diversions by his canal system to 300 second feet. This arrangement would have given the United States Reclamation Service an extra 100 second-feet for diversion from the St. Mary river and Mr. R. M. Snell, engineer in charge at Browning, Montana, was notified to that effect. Owing, however, to heavy rains in the lower Milk river valley during the latter part of August this action was found to be unnecessary, as the natural flow of Milk river increased to such an extent that the reservoir was filled by early September. The headgates of the United States Reclamation Service St. Mary canal were finally closed on the seventh of September, 1918.

No water was stored in the Sherburne reservoir during 1918, owing to the development of a slide at the north end of the dam, but the Nelson reservoir

was filled as stated above. On the Canadian side no water was stored.

Full records of the stream flow and use of water were collected during the season, under the general supervision of the two engineers delegated to represent the undersigned, and these data will be submitted to you as appendices to this report.

Messrs. Jones and Burley also made extensive studies of the seepage losses of the St. Mary river water between the outlet of the St. Mary canal and the first important diversion in the Milk river valley in the United States, a distance by river of over 300 miles. These studies are of considerable importance to the United States Government and it is understood that they will be continued and the results placed at the disposal of the Commission.

Accompanying this report are records of stream and canal flow at the several gauging stations in the Milk and St. Mary river basins. The map shows the location of the gauging stations, and a table, to which the numbers on the map refer, gives the name of each station.

Several tables and diagrams have been prepared summarizing the data and showing it graphically.

Table 1 compares the estimated requirements for 1918 with the water actually diverted.

Table 2 contains the information requested by the Commission in paragraph 9 of its order of May 24, 1918, which reads as follows:

"A statement in duplicate showing the water taken in each month by each country and the quantity thereof applied to the land, and also the quantity of water diverted from St. Mary to Milk river and stored or held back by either country."

In addition, a column has been added showing the water wasted by each country. This table does not include water diverted from tributaries of St. Mary and Milk rivers.

Table 3 gives practically the same information as Table 2, but in greater detail; it shows for St. Mary and Milk rivers the water available, diverted, used, stored, wasted and canal and reservoir losses.

Table 4 gives the available data on stream flow and diversions for the principal northern tributaries of Milk river.

The two hydrographs accompanying the report show the total flow of St. Mary and Milk rivers for the period April to September inclusive. The water diverted from St. Mary river by the United States and Canada has been plotted. Practically the entire flow of Milk river at Dodson during the latter part of May and for June, July and August was diverted or lost by seepage. Water reaching Vandalia during these months was largely return water from irrigation, or seepage from Nelson reservoir.

In conclusion it may be said that the past season has been one of the driest on record, both as regards precipitation during the growing season and run-off from the St. Mary river drainage basin. Further, while the spring flood on Milk river and its tributaries was large, the flow practically ceased after the middle of June, rendering the results from irrigated lands depending upon these sources very unsatisfactory.

Such conditions naturally resulted in a very heavy demand upon the flow of the St. Mary river, but it is believed that by careful and sympathetic

cooperation the available supply was so divided as to meet all demands which could be fulfilled with the irrigation facilities in existence at the time.

Respectfully submitted,

Accredited Irrigation Officer
of
His Majesty.

Accredited Reclamation Officer
of
United States.

Description of Tables.

Table 1.

Table 2 gives the schedule of water requirements for the year 1918 as supplied to the Commission. For purposes of comparison it gives in parallel columns the water actually diverted during the irrigation season of 1918.

Column 1 gives the estimated requirements in acre-feet. Column 2 gives the water diverted. Column 3 gives the water diverted and then wasted directly into the river without use. Column 4 gives the difference between columns 2 and 3. Column 5 gives the monthly requirements expressed as percentages of the total requirements. Column 6 gives the monthly diversions expressed as percentages of the total diversions.

The rainfall and tributary run-off for Nelson reservoir were included. There was also added the estimated loss in St. Mary River water in transit down Milk river. This loss occurred between the point of measurement of the United States Reclamation Service St. Mary canal at St. Mary crossing and the first important diversion in the United States on Milk River, the Fort Belknap canal heading near Lohman, Mont.

Water applied to the land.- For the United States Reclamation Service project below Dodson, figures supplied by the project manager were used. For the private canals in Milk River valley it was estimated that 72 per cent of the water diverted was applied to the land. This gives about half as great a loss as was found on the Milk River project. But these canals are short and the water is usually applied to the land directly from the main canal. So that the only losses would be those in the main canal.

Water stored in Nelson reservoir.- Water turned into the reservoir was assumed to include rainfall and tributary run-off. The quantities given are the excess of inflow over outflow for each month.

Table 1.

Estimated and Actual Water Requirements
Season 1918.

CANADA.

Month	Estimated require- ment Acre-feet.	Diverted Acre-feet.	Wasted Acre-feet.	Balance Acre-feet.	Percentage. Estimated. Actual	
April	1,264	857	643	214	1	.2
May	10,115	24,103	4,637	19,466	8	14.3
June	37,932	32,668	3,561	29,107	30	21.3
July	37,932	35,294	465	34,829	30	25.6
August	25,288	28,161	3,652	24,509	20	18.
September	12,644	22,731	1,300	21,431	10	15.7
October	<u>1,264</u>	<u>9,984</u>	<u>3,296</u>	<u>6,688</u>	<u>1</u>	<u>4.9</u>
Totals	126,439	153,798	17,554	136,244	100	100

UNITED STATES

Month	Estimated require- ment Acre-feet.	Diverted Acre-feet.	Wasted Acre-feet.	Balance Acre-feet.	Percentage. Estimated. Actual.	
April	1,000	1,187	90	1,097	1	1
May	8,000	11,841	885	10,956	8	11
June	30,000	22,705	1,600	21,105	30	22
July	33,000	28,314	2,495	25,819	33	27
August	20,000	28,264	1,465	26,799	20	27.7
September	7,000	11,243	850	10,393	7	10.7
October.	<u>1,000</u>	<u>1,868</u>	<u>1,265</u>	<u>603</u>	<u>1</u>	<u>0.6</u>
Totals	100,000	105,422	8,650	96,772	100	100

Description of Tables.

Table 2.

Water diverted from St. Mary River to Milk

River.- For June the flow at the gauging station at Douglas bridge on the Hudson Bay divide was used, and 8 second-feet added for seepage between St. Mary Crossing and Douglas bridge. One day was allowed for water to flow from St. Mary crossing to Douglas bridge; so the flow at Douglas bridge June 3 to July 1 was assumed the same as at St. Mary crossing June 2 to 30. The flow at St. Mary crossing July 1 to 5 was obtained from the flow at Douglas bridge in the same manner. July 6 to September 8 the water diverted was measured at the gauging station at St. Mary crossing.

Water diverted by United States.- Data were obtained from gauging stations at the heads of the following canals:

Fort Belknap canal near Chinook

Paradise Canal near Chinook

Harlem Canal near Zurich

Agency ditch near Harlem

Dodson North and South canals near Dodson.

Water wasted by the United States.- This water was returned to the river largely from the canals, but 640 acre-feet was wasted from Nelson reservoir. Most of this water, as well as part of the seepage losses from Nelson reservoir, was re-diverted at Vandalia dam.

Water diverted by Canada.- This water was measured directly at the intake of the Alberta Railway and Irrigation Company's canal at Kimball.

Water wasted by Canada.- The quantities shown in this column were turned out of the A.R. & I. Canal at Spring coulee and Magrath, returning thence to the river below all points of diversion.

Water applied to land by Canada.- The quantity shown in this column is the flow in the canal at Magrath where the use of water begins, and represents the total diversion less the water wasted and less the seepage and evaporation losses between the intake and Magrath. There is, of course, an additional evaporation and seepage loss between this point and the end of the canal system which it has been found impracticable as yet. to measure.

USE OF WATER
St. Mary - Milk River Basins.
April to October, 1918.

Month.	Diverted St. Mary to Milk Acre- feet	Diverted Canada. United Acre- feet. Acre- feet.	Wasted United Canada States Acre- feet acre- feet	Applied to the land United Canada States Acre- feet acre- feet	Chin Reservoir Acre- feet	Stored Nelson reservoir Acre- feet.
April		857 1,187	643 90	163 75		660
May		24,103 11,841	4,637 885	18,020 3,289	No	4,231
June	16,600	32,668 22,705 ^a	3,561 1,600	27,147 12,638	storage	0
July	24,100	35,294 28,314 ^a	465 2,495	32,711 12,908		0
August	15,600	28,161 28,264	3,652 1,465	22,819 3,408		11,447
Sept.	1,730	22,731 11,243	1,300 850	20,067 462		7,190
October.		9,984 1,868	3,296 1,265	6,089 47		137
Total.	58,030	153,798 105,422 ^b	17,554 8,650	127,016 ^c 32,827		23,665

a/ Includes some wasted water and seepage diverted twice.

b/ Includes St. Mary water lost by seepage and evaporation in Milk river.

c/ Includes evaporation and seepage losses in A.R. & I. Canal below Magrath.

Description of Tables.

Table 3.

Total flow of St. Mary River.- This total is the sum of flow of St. Mary River near International Boundary and United States Reclamation Service St. Mary canal at St. Mary crossing.

Water diverted from St. Mary River to Milk River.- For June the flow at the gauging station at Douglas bridge on the Hudson Bay divide was used, and 8 second-feet added for seepage between St. Mary crossing and Douglas bridge. One day was allowed for water to flow from St. Mary crossing to Douglas bridge; so the flow at Douglas bridge June 3 to July 1 was assumed the same as at St. Mary crossing June 2 to 30. The flow at St. Mary crossing July 1 to 5 was obtained from the flow at Douglas bridge in the same manner. July 6 to September 8 the water diverted was measured at the gaging station at St. Mary crossing. Douglas bridge is about 2 miles above the outlet of the canal.

Total ^{natural} flow North and South Forks at Boundary.-

This total was obtained by adding the natural flow of North Fork of Milk river near International Boundary to the flow of South Fork of Milk river near International Boundary. The natural flow of North Fork during the operation of the United States

Reclamation Service St. Mary canal was obtained from the flow at Martins ranch, about 2 miles above the outlet of the canal and above 4 miles above the boundary.

Flow of Milk River at Eastern Crossing.-

Obtained from records at the International gauging station at Eastern crossing.

Flow of Milk River at Havre.- Obtained from records at the gauging station at Havre, Mont.

Water diverted by Milk River canals.- Data were obtained from gauging stations at the heads of the following canals:

Fort Belknap canal near Chinook

Paradise canal near Chinook

Harlem canal near Zurich

Agency ditch near Harlem

Dodson North and South canals near Dodson

The rainfall and tributary run-off for Nelson reservoir was included.

Water applied to the land.- For the United States Reclamation Service project below Dodson, figures supplied by the project manager were used. For the private canals in Milk River valley it was estimated that 72 per cent of the water diverted was applied to the land.

Water stored in Nelson reservoir.- Water turned into the reservoir was assumed to include rainfall and tributary run-off. The column headed "Stored or released" shows the difference between the inflow and outflow for the month. This difference, plus the losses, gives the changes in amount in the reservoir at the end of each month, as shown in the next column.

Losses in St. Mary canal and Milk River.- These losses occurred between the point of measurement of the United States Reclamation Service St. Mary canal at St. Mary crossing and Havre, Mont., about 20 miles upstream from the first important diversion in the United States on Milk river, the Fort Belknap canal heading near Lohman, Mont. The results given are based on stream flow records of St. Mary canal at St. Mary crossing, St. Mary canal at Outlet, North and South Forks of Milk river near International Boundary, Milk river at Havre, and estimated tributary inflow.

Losses from Milk River canals.- These figures were obtained by subtracting the water applied to the land, wasted, or stored from the water diverted.

Losses from Nelson reservoir.- These losses include evaporation and seepage. The results for September are apparently too low, possibly because of an error in the table of volumes for the reservoir.

Water wasted by canals and Nelson reservoir.-

This water was returned to the river by the canals, except 640 acre-feet which was wasted from Nelson reservoir. Part of this water, as well as part of the seepage losses from Nelson reservoir, was re-diverted at Vandalia dam.

Water wasted, Milk river at Vandalia.- This column shows the flow below Vandalia dam, which is the only water wasted without chance of further use in the Milk River valley.

Canada.

Water available.- This total is the sum of the flow of the St. Mary river at Kimball plus the natural flow of the tributaries entering the river below that point, but does not include that part of the natural flow diverted by the United States Reclamation Service St. Mary canal.

Disposition,- Under this heading the first column shows the total diversion by the Alberta Railway & Irrigation Company; the second column the water returned to the river via the wasteways down Pinepound and Pot-hole creeks; the third the evaporation and seepage losses in the canal between Kimball and Magrath; and the fourth column shows the total flow at the mouth

e
of the St. Mary and represents the water which was
not diverted from the river by either the United
States or Canada.

C A N A D A .

Month	WATER AVAILABLE.					DISPOSITION.				
	St. Mary at Kimball	Pinepound Creek	Rolph Creek	Pothole Creek	Lee Creek	Combined flow	Diverted A.R. & I.	Wasted A.R. & I.	Losses A.R. & I.	St. Mary at Lethbridge
	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.
April	79,332	494	369	174	4,939	45,308	857	643	51	46,770
May	115,290	141	344	227	7,010	123,012	24,103	4,637	1,446	116,089
June	167,444	111	286	42	4,244	172,227	32,668	3,561	1,980	153,758
July	48,760	39	387	Nil	1,414	50,600	35,294	465	2,118	16,000 c
August	31,297	338	510	"	701	32,846	20,161	3,652	1,690	8,400 c
September	27,372	452	345	"	762	28,931	22,731	1,300	1,364	7,500 c
October	24,042	430	39	"	800 c	25,311	9,984	3,296	599	18,600 c
Total	453,537	2,005 b	2,280 d	443 b	19,970 b	478,235	153,798	17,554	9,228 x	367,117 a

a - Below all points of diversion

b - Natural flow only

c - Computed

d - Include some seepage water from St. Mary Canal U.S.R.S.

e - Estimated

x - Only includes evaporation and seepage between headgate and Magrath where diversion to land canals.

U N I T E D S T A T E S .

Month	WATER AVAILABLE					DIVERTED & USED NELSON RESERVOIR					WASTED		
	Total Flow St. Mary River	Diverted St. Mary to Milk River	Total natural flow No. & So. forks at boundary	Milk River at eastern crossing	Milk River at Havre	Diverted by Milk River Canals	Appl'd to the land Gross	Stored or re- leased	In Res. end of month	Nelson Res.	Total	By Milk R. Canals and Nelson Reservoir	Milk River at Vandalia
	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.	Ac. ft.
April	39,300	661	14,090	21,300	35,700	1,187	437	2,660	16,200	1,410	1,410	90	44,000
May	116,000	1887	10,980	15,800	16,000	11,841	6,725	4,231	18,400	2,031	2,031	885	34,200
June	183,600	3086	5,240	16,400	13,900	20,215	20,530	1,915	13,800	2,685	5,175	1,600	3,550
July	72,900	126	2,700	23,000	19,900	22,554	21,539	41,480	10,500	1,820	7,520	2,495	1,810
August	46,900	15,600	1,920	18,400	15,900	22,944	10,032	41,147	19,800	2,200	7,520	1,850	53,800
Septem.	29,130	470	2,050	5,860	5,830	18,868	2,288	47,190	26,700	290	1,205	850	4,840
October	23,900	389	2,150	2,670		1,868	466	137	24,800	2,037	2,037	1,265	8,300
Total	511,730	58,030	39,130	103,430		90,937	62,017			12,473	26,058	8,650 a	551,980 b

a - Some of this water was again diverted at Vandalia

b - Below all points of diversion

In connection with the attached tables showing the diversions made from Battle and Lodge creeks and the Frenchman river, it should be explained that the Canadian Reclamation Service is largely dependent upon the irrigators themselves for such records, as in the majority of cases, the diversions are too small to justify the expense of appointing and paying gauge observers in each case. As a consequence of this, the records are ~~very~~ incomplete and of doubtful value in a report such as this, since they probably do not show the total diversions. It is believed, however, that they show with a fair degree of accuracy, all the diversions during the period June 15th to October 31st.

It should be stated also that the records at the International station on Battle creek do not include the flow of the East Fork of this stream, and the records of Battle creek near Chinook will therefore give a better idea of the flow of this stream which is available to irrigators in Montana.

FRENCHMAN RIVER BASIN.Diversion in acre-feet.

<u>Irrigator</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Total</u>
F. Cross	52	143	83	278
A.M. Cross	52	37	6	95
Maple Creek Cattle Company				274
T.A. Drury	Small amount			647

LODGE CREEK.

No data collected.

BATTLE CREEK BASIN.Diversion in acre- feet.

<u>Irrigator</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Total.</u>
Lindner Bros.	88	83	151	119	0	0	0	441
* Marshall & Gaff			791	238	172	178	424	1803
S.J. Richardson	Used for 26 days in June, July and October							118
J. McKinnon	Used June 1st to October 31st							394
Stirling & Nash		6	339	69				414
F.W. Henry								67
H.J. Badger								25
J.M. Spangler			22	8	0	7	28	65
Wood & Anderson								18
								3345

* A considerable portion of this water returned to the creek by seepage from the canal above the irrigable lands of Mr. Gaff.