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FIFTY-SECOND ANNUAL REPORT

TO THE

International Joint Commission

COVERING

Calendar Year 2010

International Souris River Board

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INTERNATIONAL SOURIS
RIVER BOARD

CONSEIL INTERNATIONALE
DE LA RIVIERE SOURIS

October 2011

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

Commissioners:

In accordance with the Directive of January 22, 2007 (replaces Directives of April 11, 2002 and May 31, 1959), we have enclosed the Fifty-Second Annual Report covering calendar year 2010.

Respectively submitted,

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For the 2010 calendar year, the natural flow of the Souris River at the Sherwood Crossing was 132 005 cubic decametres (107,017 acre-feet), which represents 102 percent of the 1959-2010 long-term mean. North Dakota received 77 percent of the natural flow.

Net depletions in Canada were 30 359 cubic decametres (24,612 acre-feet). Recorded runoff for the Souris River near Sherwood, North Dakota, was 99 522 cubic decametres (80,683 acre-feet), or about 91 percent of the 1931-2010 long-term mean. The natural flow at Sherwood exceeded 50 000 cubic decametres (40,535 acre-feet), resulting in a 60/40 sharing of the natural flow at the Sherwood Crossing. The apportionment between Canada and the United States was discussed in the September 24, 2010 teleconference call. The August 31, 2010 Determination of Natural Flow showed a surplus of 21 318 cubic decametres (17,283 acre-feet) to the United States. Releases were made from Rafferty and Alameda dams to drawdown the reservoirs for the 2011 spring runoff. Calculations made after the end of the year indicated that Saskatchewan was in surplus to the United States by 48 846 cubic decametres (39,599 acre-feet).

The flow of the Souris River as it enters North Dakota at Sherwood was more than 0.113 cubic metres per second (4 cubic feet per second) except during the period of January 1 through March 11. During those periods when the flow was less than 0.113 cubic metres per second (4 cubic feet per second), the Province of Saskatchewan did not divert, store, or use any water above what would have occurred under conditions of water-use development prevailing in the Saskatchewan portion of the basin prior to the construction of Boundary Dam, Rafferty Dam, and Alameda Dam. Accordingly, Saskatchewan complied with the 0.113 cubic metres per second (4 cubic feet per second) provision specified in Recommendation No. 1 of the Interim Measures.

Recorded runoff for Long Creek at the Western Crossing as it enters North Dakota was 24 100 cubic decametres (19,538 acre-feet), or 95 percent of the long-term mean since 1959. Recommendation No. 2 of the Interim Measures was met with a net gain in the North Dakota portion of the Long Creek basin of 9 096 cubic decametres (7,374 acre-feet).

Recorded runoff leaving the United States at Westhope during the period of June 1 through October 31, 2010, was 294 097 cubic decametres (238,424 acre-feet). The flow was in compliance with the 0.566 cubic metres per second (20 cubic feet per second) minimum flow requirement as specified in Recommendation No. 3(a) of the Interim Measures for the period of June 1 through October 31, 2009.

The water quality of the Souris River in calendar year 2010 was similar to prior years. The principle water quality concerns in the Souris River basin relate to elevated concentrations of total dissolved solids (TDS), depleted dissolved oxygen, and high levels of nutrients especially phosphorus. Exceedances of specific water quality objectives at the Saskatchewan/North Dakota boundary include phosphorus, sodium, sulfate, iron, TDS, dissolved oxygen, and pH. Exceedances of specific water quality objectives at the Manitoba/North Dakota boundary include phosphorus, sodium, Fecal coliform, TDS, TSS, dissolved oxygen, pH, and picloram.

The June 14, 2010 Board public meeting was well attended by the public. The Board decided that future public meetings will be coordinated with meetings held by local water groups whenever possible. Many of the people were interested in aquatic ecosystem health.

In addition to overseeing water apportionment, the International Souris River Board maintains a watching brief of basin water-development projects, such as the Northwest Area Water Supply Project. As well, the Board fosters the sharing of flow forecasting and reservoir operation information amongst interested groups in the basin.

On May 14, 2010, the International Joint Commission appointed Colonel Michael Price to the International Souris River Board.

By letter dated July 29, 2010, former North Dakota State Engineer Dale Frink resigned his appointment as U.S. Co-Chair of the International Souris River Board effective July 31, 2010.

The International Joint Commission appointed North Dakota State Engineer Todd Sando as U.S. Co-Chair of the International Souris River Board for a two-year term beginning December 3, 2010 and ending December 2, 2012.

1.0 INTERNATIONAL SOURIS RIVER BOARD

1.1 SOURIS RIVER REFERENCE (1940)

The following excerpt describes the history of the water-apportionment program that the International Souris River Board currently maintains.

In a letter on behalf of the Government of Canada dated 20 March 1959 and a letter on behalf of the Government of the United States of America dated 3 April 1959, the International Joint Commission was informed that the Interim Measures recommended in its report of 19 March 1958, in substitution for those recommended in the report dated 2 October 1940 in response to the Souris River Reference (1940), had been accepted by both Governments.

The Governments of the United States and Canada entered into an Agreement for Water Supply and Flood Control in the Souris River Basin on October 26, 1989. Pursuant to this Agreement, the Interim Measures related to the sharing of the annual flow of the Souris River from Saskatchewan into North Dakota contained in paragraph 22(1) of the Commission's 1958 Report to the Governments were modified. In light of the modifications in 1989 and pursuant to a February 28, 1992, request from the Governments of the United States and Canada, the Commission, on April 23, 1992, directed the International Souris River Board of Control to begin applying the "Interim Measures as Modified in 1992." The measures were further modified by the Governments in December 2000. The "Interim Measures as Modified in 2000" are shown in Appendix C of this report.

1.2 INTERIM MEASURES AS MODIFIED IN 2000

In December 2000, the International Joint Commission directed the Board to implement the "Interim Measures as Modified in 2000" for the 2001 calendar year and each year thereafter. The 2000 Interim Measures, shown in Appendix C, were developed to provide greater clarification of the conditions that must prevail for the determination of the share of natural flow between Saskatchewan and North Dakota at the Sherwood Crossing.

In general, the Interim Measures provide that Saskatchewan shall have the right to divert, store, and use waters that originate in the Saskatchewan portion of the Souris River basin, provided that the annual runoff of the river into North Dakota is not thereby reduced to less than half of the runoff that would have occurred in a state of nature; that North Dakota shall have the right to divert, store, and use the waters that originate in the North Dakota portion of the basin together with the waters that cross the boundary from Saskatchewan; and that Manitoba shall have the right to use the waters that originate in the Manitoba portion of the basin and, in addition, that North Dakota must provide to Manitoba, except during periods of severe drought, a regulated flow of 0.566 cubic metres per second (20 cubic feet per second) during the months of June through October.

For the benefit of riparian users of water between the Sherwood Crossing and the upstream end of Lake Darling, the Province of Saskatchewan shall as far as practicable regulate its diversions, storage, and uses in such a manner that the flow in the Souris River channel at the Sherwood Crossing shall not be less than 0.113 cubic metres per second (4 cubic feet per second) when that level of flow would have occurred under the conditions of water-use development prevailing in the Saskatchewan portion of the drainage basin prior to the construction of Boundary Dam, Rafferty Dam, and Alameda Dam. Under certain conditions, a portion of the North Dakota share will be in the form of evaporation from

Rafferty and Alameda Reservoirs. During years when those conditions occur, the minimum flow actually passed to North Dakota will be 40 percent of the natural flow at the Sherwood Crossing. This lesser amount is in recognition of Saskatchewan's operation of Rafferty Dam and Alameda Dam for flood control.

Except in flood years, flow releases to the United States should occur in the pattern that would have occurred in a state of nature. To the extent possible and in consideration of potential channel losses and operating efficiencies, releases from the Canadian dams will be scheduled to coincide with periods of beneficial use in North Dakota. The flow release to the United States may be delayed when the State of North Dakota determines and notifies Saskatchewan through the International Souris River Board that the release would not be of benefit to the State at that time.

The State of North Dakota shall have the right to divert, store, and use the waters that originate in the North Dakota portion of the Souris River basin together with the waters delivered to the State of North Dakota at the Sherwood Crossing, provided that any diversion, use, or storage of Long Creek water shall not diminish the annual runoff at the Eastern Crossing of Long Creek into Saskatchewan below the annual runoff of Long Creek at the Western Crossing into North Dakota.

In periods of severe drought, when it becomes impracticable for North Dakota to deliver the regulated flow of 0.566 cubic metre per second (20 cubic feet per second), North Dakota's responsibility to Manitoba will be limited to providing such flows as the Board determines to be practicable and in accordance with the objective of making water available for human and livestock consumption as well as for household use.

1.3 BOARD OF CONTROL

At its meeting in May 1959, the International Joint Commission officially approved and signed a directive that created the International Souris River Board of Control. At that time, the Board was charged with the responsibility of ensuring compliance with the Interim Measures set out and of submitting to the Commission such reports as the Commission may require or as the Board at its discretion may desire to file.

1.4 AMALGAMATION OF THE INTERNATIONAL SOURIS-RED RIVERS ENGINEERING BOARD AND INTERNATIONAL SOURIS RIVER BOARD OF CONTROL

In 2000, the International Joint Commission directed the International Souris-Red Rivers Engineering Board to transfer its responsibilities that related to the Souris River to the International Souris River Board of Control. The Commission also changed the International Souris River Board of Control's name to the International Souris River Board.

1.5 AMALGAMATION OF THE INTERNATIONAL SOURIS RIVER BOARD AND SOURIS RIVER BI-LATERAL WATER QUALITY MONITORING GROUP

In 2006 the International Joint Commission changed the Board’s mandate. Because of the change in the mandate and the desire of the Commission to move to a more encompassing watershed approach, the Board was requested to develop a Directive based on existing Commission responsibilities in the Souris River basin that would move toward an enhanced mandate for the Board. By letter dated January 22, 2007, the International Souris River Board was officially notified by the Commission that the new directive dated January 18, 2007, replaced the previous directive dated April 11, 2002. The new Directive sets out the duties of the Board as it moves toward a watershed approach in the Souris River basin and combined the duties of the International Souris River Board and Souris River Bi-Lateral Water Quality Monitoring Group. It also increased the membership of the Board to twelve members.

The Board's duties were revised to include the following:

- Maintain an awareness of existing and proposed developments, activities, conditions, and issues in the Souris River basin that may have an impact on transboundary water levels, flows, water quality, and aquatic ecosystem health and inform the Commission about existing or potential transboundary issues.

- Oversee the implementation of compliance with the Interim Measures as Modified for Apportionment of the Souris River as described in Appendix A of the Directive.

- Assist the Commission in the review of a Joint Water Quality Monitoring Program.

- Perform an oversight function for flood operations in cooperation with the designated entities identified in the 1989 Canada-United States Agreement for Water Supply and Flood Control in the Souris River Basin.

- Report on aquatic ecosystem health issues in the watershed and regularly inform the Commission on the state and implications of aquatic ecosystem health.

- Carry out such other studies or activities as the Commission may, from time to time, request.

- Prepare an annual work plan including both routine board activities and new initiatives planned to be conducted in the subsequent year.

- The Board shall submit an annual report covering all of its activities at least three weeks in advance of the Commission's fall semi-annual meeting, and the Board shall submit other reports as the Commission may request or the Board may feel appropriate in keeping with this Directive.

- The Board shall provide opportunities for the public to be involved in its work, including at least one public meeting in the basin each year. The Board has agreed to hold the public meeting in the spring/summer and to advertise it.

In 2007 three committees were established to assist with administering the conditions of the Board's mandate. The Natural Flow Methods Committee was renamed as the Hydrology Committee, which is charged with investigating procedures and questions on the approach and methods used to determine the natural flow of the Souris River basin. The Flow Forecasting Liaison Committee has the responsibility to ensure there is information sharing and coordination between the forecasting agencies in the basin. The Ecosystem Health Committee has responsibility to identify water quality and aquatic health concerns in the basin and report on the adequacy of the aquatic quality monitoring programs. Membership on these committees includes all affected agencies in the basin.

1.6 BOARD MEMBERS

At the end of 2010, the members of the International Souris River Board were as follow:

Todd Sando North Dakota State Engineer Bismarck, North Dakota	Member for the United States (Co-Chair)
Col. Michael Price U.S. Army Corps of Engineers St. Paul, Minnesota	Member for the United States
Gregg Wiche U.S. Geological Survey Bismarck, North Dakota	Member for the United States
Megan Estep U.S. Fish and Wildlife Service Denver, Colorado	Member for the United States
Dennis Fewless North Dakota Department of Health Bismarck, North Dakota	Member for the United States
Scott Gangl North Dakota Game and Fish Department Bismarck, North Dakota	Member for the United States
Russell Boals Retired Regina, Saskatchewan	Member for Canada (Co-Chair)
Robert Harrison Manitoba Water Stewardship Winnipeg, Manitoba	Member for Canada
Doug Johnson Saskatchewan Watershed Authority Moose Jaw, Saskatchewan	Member for Canada
Richard Zitta Saskatchewan Environment Regina, Saskatchewan	Member for Canada
Dwight Williamson Manitoba Water Stewardship Winnipeg, Manitoba	Member for Canada
David Donald Environment Canada Regina, Saskatchewan	Member for Canada

2.0 2010 ACTIVITIES OF THE BOARD

Since the presentation of the Fifty First Annual Report to the International Joint Commission, the International Souris River Board has held two meetings and has had two teleconference calls. The discussions and decisions made are summarized in the following sections

2.1 FEBRUARY 23, 2010, MEETING IN LAKEWOOD, COLORADO

Members in attendance were:

Russell Boals
Member for Canada

Doug Johnson
Member for Canada

David Donald
Member for Canada

Dwight Williamson
Member for Canada

Dale Frink
Member for the United States

Megan Estep
Member for the United States

Gregg Wiche
Member for the United States

Col. Jonathan Christensen
Member for the United States

Dennis Fewless
Member for the United States

The Determination of Natural Flow of the Souris River at Sherwood for the period of January 1 through December 31, 2009, was presented at the February 23, 2010, meeting. The final apportionment balance for the 2009 calendar year showed that Saskatchewan was in surplus to North Dakota by 20 273 cubic decametres (16,435 acre-feet). The summary of the natural flow computations showed that 2009 had the highest flows since 2001.

The Saskatchewan Watershed Authority reported that as of February 15, 2009, above normal winter precipitation had resulted in the potential for above median flows in the basin. Precipitation in the Saskatchewan portion of the basin was above normal since November 1, 2008.

Due to less runoff from Saskatchewan and normal spring runoff, the duration of flooding in Manitoba was much less than the second largest flood on record, which occurred in 1999. The 2009 spring flood on the Souris River produced the highest stages since 1999 in the Manitoba portion of the basin and in some areas the second highest stages for the past 30 years.

The United States Geological Survey reported the peak flow at Sherwood was 1,350 cubic feet per second (38.2 cubic metres per second) on April 19. This ranked 34th in 79 years of record. The peak flow at Westhope was 161.4 cubic metres per second (5,700 cubic feet per second) on April 30. This ranked 7th in 79 years of record. Westhope for the period June 1 to October 31 was 106 405 cubic decametres (86,262 acre-feet). This was 98 919 cubic decametres (80,193 acre-feet) more than the 7 486 cubic decametres (6,069 acre feet) North Dakota is required to deliver to Manitoba.

The Hydrology Committee informed the International Souris River Board that its task to look at the development of a model to evaluate changes in the operating level of Lake Darling now included hydraulics, hydrology, and water quality. It was unsure as to what type of modeling may be done. The International Souris River Board informed the Hydrology Committee that there were several objectives:

i. Implication of the change in operating level on Lake Darling

ii. Implication of application of drought criteria

iii. The methodology of determining consumptive use of the reservoirs

They were not looking for a comprehensive model at the time, but input from the Hydrology Committee on the implications and what type of modeling and data collection might be required to address those implications. The Hydrology Committeee was tasked to prepare a spreadsheet format compilation of models used in the Souris River Basin and review future needs and requirements.

The Flow Forecasting Liason Committee reported there was very good liaison between all agencies of the SRFFLC in 2009. They reported that Brian Connolly, Hydrologist with the U.S National Weather Service would serve as the U.S co-chair and Martin Grajczyk, Hydrologist with the Saskatchewan Watershed Authority would serve as the Canadian co-chair.

The North Dakota State Health Department reported that some numeric parameters have been added based on toxicological science on impact on human health and aquatic ecosystem health. Fecal coliform is being deleted and replaced with e. coli.

The Aquatic Ecosystem Health Committee recommended suspending phenol monitoring and the International Souris River Board voted to suspend the phenol monitoring program for 2010. The Aquatic Ecosystem Health Committee was to review the phenol data and provide a written report to the Board.

The Saskatchewan Watershed Authority forecasted median to above normal flows in the basin (approximately a 1 in 10 year event) with precipitation in the Saskatchewan portion of the basin being 100 to 150% of normal from November 1, 2009 to February 16, 2010. Antecedent conditions are wet with depression storage in Saskatchewan being full.

The National Weather Service reported the Souris River basin had an unusually heavy snowpack and accompanying snow water equivalent. The runoff would be highly dependent on the amount of precipitation received before the spring melt. If precipitation follows the normal cycle for the next month, snow water equivalents will be about 130% of current values.

Manitoba Water Stewardship forecasted above average spring runoff. They said soil moisture was close to normal but snowcover was well above average. They were expecting flooding along the Manitoba portion of the Souris River but peak stages were expected to be lower than 2009 crests.

The International Souris River Board members decided to hold a conference call on March 23 to discuss whether to declare 2010 a flood year.

2.2 March 23, 2010, TELECONFERENCE CALL

Members in attendance were:

Russell Boals Member for Canada	Dale Frink Member for the United States
Doug Johnson Member for Canada	Col. Jonathan Christensen Member for the United States
Robert Harrison Member for Canada	Gregg Wiche Member for the United States
Dwight Williamson Member for Canada	Scott Gangl Member for the United States

The purpose of the teleconference call was to discuss the mid-March runoff forecast and determine if flood operations should be declared. The Board decided that flood operations were not required. The Saskatchewan Watershed Authority explained that temperatures for the last few weeks had been above freezing during the day with a return to below freezing temperatures at night. This resulted in a slow melt that reduced the runoff potential from what had been expected in late February. Saskatchewan Watershed Authority estimated the runoff would be below a 1 in 10 event.

North Dakota reported that similar conditions existed in the North Dakota portion of the basin. The snow pack was disappearing in western North Dakota. North Dakota reported that runoff in the lower part of the Souris River basin around Towner had resulted in bank full flows.

The United States Fish and Wildlife Service was reducing their release from Lake Darling. Their spring target elevation was 1597.5 feet and there was concern that they may not reach that elevation. There was no local runoff to Lake Darling downstream of the International Boundary and required 14,000 acre-feet to fill Lake Darling. The Saskatchewan Watershed Authority estimated that volume will likely come from the Upper Moose Mountain runoff.

2.3 June 15, 2010, MEETING IN MINOT, NORTH DAKOTA

Members of ISRB in attendance were:

Russell Boals Member for Canada	Dale Frink Member for the United States
Doug Johnson Member for Canada	Megan Estep Member for the United States
David Donald Member for Canada	Scott Gangl Member for the United States
Robert Harrison Member for Canada	Gregg Wiche Member for the United States
Dwight Williamson Member for Canada	Dennis Fewless Member for the United States

Spring runoff in 2010 in the Saskatchewan portion of the Souris River basin was above normal. Precipitation for April through June across Western Canada was over 200% of normal. Flooding was prevalent in many areas of Saskatchewan. About 5 million acres remained unseeded in Saskatchewan due to the wet conditions. Rafferty and Boundary reservoirs both filled and spilled. Alameda was just below FSL.

In February it appeared that conditions were right for flood operations, however, spring flows in the upper North Dakota portion of the basin were lower than expected due to significant sublimation of the snowpack in Saskatchewan and a slow melt in North Dakota. In the lower North Dakota portion of the basin the flows were higher. Peak flows at Sherwood and Westhope were below normal.

In Manitoba spring runoff and peak flows were less than forecast in February. Peak flows were below average to average. Runoff started in March but as in North Dakota, was slowed by a gradual melt.

The total volume at the Long Creek near Noonan gage for the period January 1 through May 31, 2010, was 7 225 cubic decametres (5,860 acre-feet) or 5.8 percent of the combined flows for calendar years 2003 – 2009. The total flow at the Souris River near Sherwood gage for the period January 1 through May 31, 2010, was 14 405 cubic decametres (11,678 acre-feet) or 4.4 percent of the combined flows for calendar years 2003 – 2009.

A summary of the interim natural flow computations for the period of January 1 through May 31, 2010, was presented at the meeting. The recorded flow at Sherwood during the 5-month period was 14 405 cubic decametres (11,678 acre-feet). The computed natural flow at the Sherwood Crossing for the period was 35 078 cubic decametres (28,438 acre-feet). Because this was under the 50 000 cubic decametres (40,535 acre-feet) criterion, the United States share on a 50/50 basis was 17 540 cubic decametres (14,220 acre-feet. The United States received 16 100 cubic decametres (13,052 acre-feet) resulting in a deficit of 1 440 cubic decametres (1,167 acre-feet) as of May 31. A surplus of 1 325 cubic decametres (1,074 acre-feet) was made on Long Creek therefore Recommendation 2 of the 2000 Interim Measures as Modified was met. The International Souris River Board accepted the compilation of flows and the computed apportionment balance for the period of January 1 through May 31, 2010.

Co-Chair for the United States, Dale Frink, announced he was retiring as North Dakota State Engineer. Dale stated he would be submitting his resignation from the International Souris River Board.

The June 14, 2010 ISRB public meeting went well with ten people attending the meeting. There was considerable discussion on water and who had jurisdiction when there were conflicts between the City of Minot and McHenry County.

The North Dakota State Health Departments presentation on water quality in the basin was well received and was informative for both the public and the International Souris River Board.

2.4 SEPTEMBER 24, 2010, TELECONFERENCE CALL

Members in attendance were:

Russell Boals
Member for Canada

Robert Harrison
Member for Canada

Doug Johnson
Member for Canada

David Donald
Member for Canada

Dale Frink
Member for the United States

Gregg Wiche
Member for the United States

Megan Estep
Member for the United States

Dennis Fewless
Member for the United States

Scott Gangl
Member for the United States

The purpose of the teleconference call was to review the flow conditions and discuss the apportionment balance of the Souris River for the period of January 1 through August 31, 2010. In the May 31, 2010 Determination of Natural Flow, there was a 1 440 cubic decametres (1,167 acre-feet) deficit. Summer precipitation, which was 180 to 200 percent of normal resulted in a surplus to North Dakota of 21 318 cubic decametres (17,283 acre-feet) by August 31, 2010.

The Board determined that the surplus and the current flow in the river would satisfy apportionment obligations for 2010 at the Sherwood Crossing.

The Saskatchewan Watershed Authority noted that Alameda Reservoir was 1.4 metres (4.6 feet) above the required February 1 target elevation. Some 16 000 cubic decametres (12,970 acre-feet) of water would be released from Alameda. The plan was to release 1-2 cubic metres per second (35-70 cubic feet per second) through to February 1, 2011. A release from Rafferty of about 2-3 cubic metres per second (70 to 105 cubic feet per second) was also planned. The United States Fish and Wildlife Service said there was 12 335 cubic decametres (10,000 acre-feet) to be released from the refuges.

3.0 MONITORING

3.1 INSPECTIONS OF THE BASIN

During the year, the staff of the Water Survey Division of Environment Canada, Saskatchewan Watershed Authority, the North Dakota State Water Commission, Manitoba Water Stewardship, and the United States Geological Survey carried out frequent field inspections of the Souris River basin.

3.2 GAUGING STATIONS

A list of the gauging stations being operated in the Souris River basin is given in Table 1. In addition, the United States Geological Survey operated three miscellaneous stream flow-measurement sites in the vicinity of the Eaton Irrigation Project near Towner, North Dakota.

The station numbers and the locations of the hydrometric stations measuring streamflow are shown in Part I of Table 1. The gauging station numbers and the locations of the hydrometric stations located on lakes and reservoirs in the basin are shown in Part II of Table 1.

Table 1.
STREAMFLOW, WATER-LEVEL, AND WATER QUALITY STATIONS
IN THE SOURIS RIVER BASIN
Part I--Streamflow

Index number	Stream	Location	State or province	Operated by
05NA003 (05113360)	Long Creek[1]	at Western Crossing	Saskatchewan	Environment Canada
05NA004	Long Creek	near Maxim	Saskatchewan	Saskatchewan Watershed Authority
05NA005	Gibson Creek	near Radville	Saskatchewan	Environment Canada
05NB001	Long Creek	near Estevan	Saskatchewan	Environment Canada
05NB011	Yellowgrass Ditch	near Yellowgrass	Saskatchewan	Environment Canada
05NB014	Jewel Creek	near Goodwater	Saskatchewan	Environment Canada
05NB017	Souris River	near Halbrite	Saskatchewan	Environment Canada
05NB018	Tatagwa Lake Drain	near Weyburn	Saskatchewan	Environment Canada
05NB021 (05113800)	Short Creek[1]	near Roche Percee	Saskatchewan	Environment Canada
05NB031	Souris River	near Bechard2	Saskatchewan	Saskatchewan Watershed Authority
05NB033	Moseley Creek	near Halbrite	Saskatchewan	Environment Canada
05NB034	Roughbark Creek	near Goodwater	Saskatchewan	Environment Canada
05NB035	Cooke Creek	near Goodwater	Saskatchewan	Environment Canada
05NB036	Souris River	below Rafferty Reservoir	Saskatchewan	Environment Canada
05NB038	Boundary Reservoir Diversion Canal	near Estevan	Saskatchewan	Environment Canada
05NB039	Tributary	near Outram	Saskatchewan	Environment Canada

05NB040	Souris River	near Ralph	Saskatchewan	Environment Canada
05NB041	Roughbark Creek	above Rafferty Reservoir	Saskatchewan	Environment Canada
05NC001	Moose Mountain Creek	below Moose Mountain Lake	Saskatchewan	Saskatchewan Watershed Authority
05ND004	Moose Mountain Creek	near Oxbow	Saskatchewan	Environment Canada
05ND010	Moose Mountain Creek	above Alameda Reservoir	Saskatchewan	Environment Canada
05ND011	Shepherd Creek	near Alameda	Saskatchewan	Environment Canada
05NE003	Pipestone Creek	above Moosomin Reservoir	Saskatchewan	Environment Canada
05NF001	Souris River	at Melita	Manitoba	Environment Canada
05NF002	Antler River	near Melita	Manitoba	Environment Canada
05NF006	Lightning Creek	near Carnduff	Saskatchewan	Environment Canada
05NF007	Gainsborough Creek	near Lyleton	Manitoba	Environment Canada
05NF008	Graham Creek	near Melita	Manitoba	Environment Canada
05NF010	Antler River	near Wauchope	Saskatchewan	Environment Canada
05NG001	Souris River	at Wawanesa	Manitoba	Environment Canada
05NG003	Pipestone Creek	near Pipestone	Manitoba	Environment Canada
05NG007	Plum Creek	near Souris	Manitoba	Environment Canada
05NG012	Elgin Creek	near Souris	Manitoba	Environment Canada
05NG020	Medora Creek	near Napinka	Manitoba	Environment Canada
05NG021	Souris River	at Souris	Manitoba	Environment Canada
05NG024	Pipestone Creek	near Sask. Boundary	Manitoba	Environment Canada
05113520	Long Creek Tributary	near Crosby	North Dakota	U.S. Geological Survey
05113600 (05NB027)	Long Creek[1 3]	near Noonan	North Dakota	U.S. Geological Survey
05114000 (05ND007)	Souris River[1 3]	near Sherwood	North Dakota	U.S. Geological Survey
05116000	Souris River[3]	near Foxholm	North Dakota	U.S. Geological Survey
05116135	Tasker Coulee Tributary	near Kenaston	North Dakota	U.S. Geological Survey
05116500	Des Lacs River[3]	at Foxholm	North Dakota	U.S. Geological Survey
05117500	Souris River[3]	above Minot	North Dakota	U.S. Geological Survey
05119410	Bonnes Coulee	near Velva	North Dakota	U.S. Geological Survey
05120000	Souris River[3]	near Verendrye	North Dakota	U.S. Geological Survey
05120180	Wintering River Tributary	near Kongsberg	North Dakota	U.S. Geological Survey
05120500	Wintering River[3]	near Karlsruhe	North Dakota	U.S. Geological Survey
05122000	Souris River[3]	near Bantry	North Dakota	U.S. Geological Survey
05123300	Oak Creek Tributary	near Bottineau	North Dakota	U.S. Geological Survey
05123400	Willow Creek[3]	near Willow City	North Dakota	U.S. Geological Survey
05123510	Deep River[3]	near Upham	North Dakota	U.S. Geological Survey
05124000 (05NF012)	Souris River[1 3]	near Westhope	North Dakota	U.S. Geological Survey

Table 1.
STREAMFLOW, WATER-LEVEL, AND WATER QUALITY STATIONS
IN THE SOURIS RIVER BASIN
Part II--Water Level

Index number	Stream	Location	State or province	Operated by
05113750	East Branch Short Creek Reservoir	near Columbus	North Dakota	U.S. Geological Survey
05115500	Lake Darling	near Foxholm	North Dakota	U.S. Geological Survey
LGNN8	Souris River	at Logan	North Dakota	U.S. Corps of Engineers U.S. N. Weather Service
SWRN8	Souris River	at Sawyer	North Dakota	U.S. Corps of Engineers U.S. N. Weather Service
TOWN8	Souris River	at Towner	North Dakota	U.S. Corps of Engineers U.S. N. Weather Service
VLVN8	Souris River	at Velva	North Dakota	U.S. Corps of Engineers U.S. N. Weather Service
	Upper Souris Refuge Des Lacs Refuge J. Clark Salyer Refuge	Dams 87 and 96 Units 1 - 8 inclusive Dams 320, 326, 332, 341, and 357	North Dakota	U.S. Fish and Wildlife
05NA006	Larsen Reservoir	near Radville	Saskatchewan	Environment Canada
05NB012	Boundary Reservoir	near Estevan	Saskatchewan	Saskatchewan Watershed Authority
05NB016	Roughbark Reservoir	near Weyburn	Saskatchewan	Environment Canada
05NB020	Nickle Lake	near Weyburn	Saskatchewan	Environment Canada
05NB032	Rafferty Reservoir	near Estevan	Saskatchewan	Environment Canada
05NC002	Moose Mountain Lake	near Corning	Saskatchewan	Environment Canada
05ND008	White Bear (Carlyle) Lake	near Carlyle	Saskatchewan	Environment Canada
05ND009	Kenosee Lake	near Carlyle	Saskatchewan	Saskatchewan Watershed Authority.
05ND012	Alameda Reservoir	near Alameda	Saskatchewan	Environment Canada
05NE002	Moosomin Lake	near Moosomin	Saskatchewan	Environment Canada
05NF804	Metigoshe Lake	near Metigoshe	Manitoba	Manitoba Water Stewardship
05NF805	Sharpe Lake	near Deloraine	Manitoba	Manitoba Water Stewardship
05NG023	Whitewater Lake	near Boissevain	Manitoba	Environment Canada
05NG801	Plum Lake	above Deleau Dam	Manitoba	Manitoba Water Stewardship
05NG803	Elgin Reservoir	near Elgin	Manitoba	Manitoba Water Stewardship
05NG806	Souris River	above Hartney Dam	Manitoba	Manitoba Water Stewardship
05NG807	Souris River	above Napinka Dam	Manitoba	Manitoba Water Stewardship
05NG809	Plum Lake	near Findlay	Manitoba	Manitoba Water Stewardship
05NG813	Oak Lake	at Oak Lake Resort	Manitoba	Manitoba Water Stewardship
05NG814	Deloraine Reservoir	near Deloraine	Manitoba	Manitoba Water Stewardship

Table 1.
STREAMFLOW, WATER-LEVEL, AND WATER QUALITY STATIONS
IN THE SOURIS RIVER BASIN
Part III--Water Quality

Index number	Stream	Location	State or province	Operated by
05114000	Souris River[1 3]	near Sherwood	North Dakota	U.S. Geological Survey
(05ND007)				
05115500	Lake Darling	near Foxholm	North Dakota	U.S. Geological Survey
05116000	Souris River[3]	near Foxholm	North Dakota	U.S. Geological Survey
05116500	Des Lacs River[3]	at Foxholm	North Dakota	U.S. Geological Survey/ N.D. Dept. of Health
(380021)				
05117500	Souris River[3]	above Minot	North Dakota	U.S. Geological Survey/ N.D. Dept. of Health
(380161)				
05120000	Souris River[3]	near Verendrye	North Dakota	U.S. Geological Survey/ N.D. Dept. of Health
(380095)				
05122000	Souris River[3]	near Bantry	North Dakota	U.S. Geological Survey
05123400	Willow Creek[3]	near Willow City	North Dakota	U.S. Geological Survey
05123510	Deep River[3] J. Clark Salyer Refuge	near Upham Pool 357	North Dakota	U.S. Fish and Wildlife
05124000	Souris River[1 3]	near Westhope (QA)	North Dakota	U.S. Geological Survey
(05NF012)				

[1] International gauging station

[2] Formerly published as Souris River below Lewvan

[3] Operated jointly for hydrometric and water-quality monitoring

4.0 TRANSBOUNDARY WATER QUALITY OBJECTIVES AND MONITORING

4.1 OVERVIEW OF WATER QUALITY

The water quality of the Souris River at the International Boundary has been monitored by the International Souris River Board (formerly the Souris River Bilateral Water Quality Monitoring Group) since 1990.

Water quality objectives are established at the two border crossings. When water quality objectives are not achieved such conditions are referred to as "exceedances." A summary of water quality exceedances for 2010 is reported in Appendix E. Historical data is also included.

The principal water quality concerns in the Souris River basin relate to elevated concentrations of total dissolved solids (TDS), depleted dissolved oxygen and high levels of nutrients especially phosphorus.

A total of 5 samples were collected by the USGS in 2010.

Exceedances of specific water quality objectives at the Saskatchewan/North Dakota boundary include phosphorus, sodium, iron, TDS and dissolved oxygen. These results are relatively consistent with prior year's data except for sulfate and pH for which no exceedances were observed.

Total phosphorus exceeded the objective of 0.10 milligrams per liter in 80 percent of the samples. The maximum phosphorus concentration was 0.31 milligrams per liter, which is 3 times the objective. TDS also exceeded the objective of 1,000 milligrams per liter in 20 percent of the samples. Sodium and sulfate represent major constituents in the mineral composition of the Souris River and exceeded objectives 40 percent and 0.0 percent respectively.

Dissolved oxygen ranged from 0.6 milligrams per liter to 13 milligrams per liter. A concentration of less than 5.0 milligrams per liter is considered an exceedance and this occurred in 17 percent of the samples.

A total 10 samples were collected by Environment Canada in 2010. Nine were collected at Westhope (Manitoba/North Dakota boundary) and one was collected at Sherwood (Saskatchewan/North Dakota boundary) as part of the yearly joint USGS/EC QA/QC program.

The number of exceedances (percentage of exceedances given in parenthesis) at Westhope has decreased compared to 2009, even though Fecal coliform (13%), Chloride (13%), Phosphorus (100%), Sodium (63%), Sulfate (13%), Total Dissolved Solids (25%), Total Suspended Solids (13%), pH (13%), Dissolved Oxygen (13%) and Picloram (25%) exceeded their Objective at least once. The decreases maybe partially attributed to higher flows in the basin. Phosphorus which exceeded the 0.100 mg/L objective (100%) ranged from 0.148 mg/L to 0.426 mg/L and Sodium which exceeded it's objective of 100 mg/L (63%) ranged from 122 mg/L to 434 mg/L. Picloram exceeded the WQO of 0.05 ug/L for the first time in ten years with a concentration of 0.0607 ug/L on May 5, 2010 and over the past ten years iron has always exceeded the WQO of 300 ug/L, however, this year iron did not exceed the WQO. The highest value was 260 ug/L.

4.2 CHANGES TO POLLUTION SOURCES IN 2010

There were no major changes to pollution sources in 2010. The most prevalent source of pollution is nonpoint pollution from agriculture. Agriculture dominates the land use of the Souris River basin, therefore, it can be surmised that contributions of phosphorus and nitrogen are substantial from these sources. Point sources of pollution from the cities of Estevan and Minot have been reduced by advanced wastewater treatment. Smaller cities continue to discharge effluent intermittently.

Future threats to water quality and aquatic ecosystem health include energy development, water appropriations that reduce flows, and reservoir operations.

4.3 TREND ANALYSIS REPORT

The latest Trend Analysis report was finalized in 2000 by the Souris River Bilateral Water Quality seasonal variability in daily discharge. The methodology used was compatible with changes in monitoring frequency and timing. The United States Geological Survey made slight changes to the model in 2003.

4.4 MONITORING PLAN CHANGES

No monitoring changes were implemented for 2010. The 2010 monitoring plan can be found in Appendix F.

4.5 SEDIMENT TOXICITY TESTING

Pollutants entrained in or attached to sediment represent an unassessed component of water quality at the two boundary sites.

The Board will continue to evaluate the various sediment toxicity testing protocols and, eventually, select an appropriate method and conduct tests at some point in the future when resources become available.

4.6 REVISION OF PHOSPHORUS OBJECTIVES

Phosphorus concentrations tend to be high in prairie soils. Under pre-settlement conditions, phosphorus could enter surface water by erosion, transported plant material, and animal activities. Human activities and hydrologic modifications exacerbate phosphorus loadings, which increases primary productivity. This process, called eutrophication has likely been accelerated in the Souris River. Common sources of phosphorus enrichment are municipal effluent, non-point contributions from agriculture, livestock, and hydrologic modifications. Substantial progress has been made in reducing phosphorus loading from Minot and Estevan by incorporating advanced wastewater treatment. Implementation of Best Management Practices on agricultural land, and installing animal waste systems has reduced loadings from these activities.

Dams frequently have a substantial additive affect on phosphorus loading. Large reservoirs that are recently constructed, and have hypolimnic releases, generally contribute high phosphorus loads. Low head dams can contribute to extremely high phosphorus loadings. These reservoirs often inundate nutrient rich prairie soils. The reservoirs often become anoxic during winter, releasing additional phosphorus from bottom sediments. As well, the reservoirs attract waterfowl that contribute large nutrient loadings to the system. The fall waterfowl population frequently moves out of the lower Souris River just prior to ice up. The organic load from waterfowl does not have sufficient time to become assimilated and, therefore, causes an oxygen demand that is not satisfied until the following open water period. Also, decaying vegetation in the off channel area contributes to anoxic conditions. Phosphorus release from the waterfowl contributions, decaying vegetation, and internal loading from the sediments results in significantly higher phosphorus concentrations than if the system was aerobic. Downstream loading at the border is very high, because spring runoff occurs prior to ice out, thereby purging these shallow ponds.

The phosphorus objective was reviewed as it was noted that phosphorus frequently exceeds the objective criterion at both border sites. Phosphorus tends to be quite high in concentration in prairie streams and differentiating between agricultural practices and baseline phosphorus concentrations remain largely unknown. It was decided that, since many initiatives, both in the United States and Canada, are moving forward on nutrient management, that it would be doubtful whether new information could be shed on this issue until the science was further developed. The review noted that the loading issue of phosphorus to Lake Darling would be important information; however, until a nutrient budget on Lake Darling is completed, the most appropriate course of action is to maintain the present nutrient objective.

The Board will not change the numeric objective of 0.10 mg/L for total phosphorus at the present time and referred the matter to the Aquatic Ecosystem Health Committee.

4.7 WINTER ANOXIA

Winter anoxia as the result of low dissolved oxygen and fish kills in the Souris basin has been documented on many occasions. Factors contributing to low oxygen levels have not been determined, but some possibilities could be increased sediment oxygen demand, macrophyte decomposition, organic enrichment, ground water influence, photosynthesis suppression, low flow, or dams. A dissolved oxygen concentration of 0.6 milligrams per liter was measured during 2010 at the North Dakota/Saskatchewan boundary and 0.47 milligrams per liter was measured during 2010 at the North Dakota/Manitoba boundary. These measurements were recorded during routine monitoring conducted by the United States Geological Survey and Environment Canada. The areal extent of the anoxia was not determined. The Board agreed to keep a watch on dissolved oxygen conditions and the North Dakota Department of Health and Environment Canada will attempt to collect dissolved oxygen and ammonia samples if low flow conditions prevail during future winters.

The upper portion of the Souris River was listed as impaired in 2004. This designation means this reach of the river needs a total maximum daily load (TMDL) study. The impairment for aquatic life is dissolved oxygen, and the impairment for recreation is fecal coliform bacteria. The study reach is 43.4 miles downstream from the border to Lake Darling. The lower portion of the Souris River in Saskatchewan from Glen Ewen to the border is also included. A final report was available for the Fecal Coliform bacteria TMDL in August 2010 and the final report for the Dissolved Oxygen TMDL was available in September 2010.

The Fecal Coliform bacteria TMDL suggests the primary contributors are animal feeding areas located in close proximity to the Souris River with the majority of those occurring in Canada. The dissolved oxygen TMDL identifies sediment oxygen demand as the primary source of oxygen depletion in the Souris River.

4.8 SHORT CREEK DAM FISH KILL

A massive fish kill was reported at Short Creek Dam on July 2, 2010. The dam is located on a north flowing tributary approximately 0.5 miles from Canada. Very high precipitation was noted prior to July 2. The fish kill resulted from an absence of oxygen.

5.0 WATER-DEVELOPMENT ACTIVITIES IN 2010

5.1 NORTHWEST AREA WATER SUPPLY PROJECT

The Garrison Diversion Municipal, Rural, and Industrial (MRI) water-supply program, passed by the United States Congress on May 12, 1986, as part of the Garrison Diversion Reformation Act of 1986, authorized the appropriation of federal funds for the planning and construction of water-supply facilities throughout North Dakota. An agreement between the North Dakota State Water Commission and the Garrison Conservancy District in 1986 provided a method through which the agencies can request funding for MRI water-system projects from the Secretary of the Interior. On the basis of this agreement, the Northwest Area Water Supply (NAWS) study was initiated in November 1987.

The NAWS project has been designed to supply a reliable source of treated water to cities, communities, and rural water systems in 10 counties in northwestern North Dakota. The project has an estimated cost of $217 million.

The water supply for the project is Lake Sakakawea, located in the Missouri River system. The annual use authorized under the State of North Dakota water permit is 18 502 dam3 (15,000 acre-feet).

Canada is concerned that the NAWS project could permit the interbasin transfer of non-native biota. The St. Mary–Milk project in Montana and Alberta diverts untreated water from the Hudson Bay drainage basin to the Missouri River basin. NAWS, however, would be the first project to divert water across the continental divide to the Hudson Bay drainage basin.

The Province of Manitoba filed suit in U.S. District Court. The court required the project undergo further NEPA review, and placed an injunction on the project.

On April 15, 2005, the Court modified the injunction to allow the construction on the line between Lake Sakakawea and Minot to continue.

On March 24, 2006, the Court modified the injunction to allow additional construction of the Minot High Service Pump Station, the pipeline from the High Service Pump Station to the northern part of the City of Minot, and the pipeline to Berthold to proceed. It was determined that this construction would not affect treatment decisions. Design work on these projects was completed in 2006 and contract awards were made in 2007 and 2008. All 45 miles of this pipeline were completed by the summer of 2008. Berthold started receiving water in August 2008. The High Service Pump Station started operating in December 2009.

On March 18, 2008, the Court again modified the injunction to allow additional design and construction activities for the entire Northern Tier for features not affecting treatment decisions. The Kenmare-Upper Souris project started serving water in December 2009. The NAWS-All Seasons-Upham pipeline started serving water in September 2009. The Mohall-Sherwood-All Seasons pipeline has planned completion in Spring 2012. The Minot Air Force Base pipeline and the Upper Souris-Glenburn segment north of the Air Force Base have planned completion in 2012. Berthold, the Kenmare-Upper Souris project, and the NAWS-All Seasons-Upham pipeline are currently receiving limited water supply from the Minot and Sundre aquifers.

5.2 WATER APPROPRIATIONS

5.2.1 Background

In 1995, the International Souris River Board adopted a new method for reporting minor project diversions for the purpose of determining apportionment. The new method uses a common set of criteria and ensures that the same criteria will be used in both Saskatchewan and North Dakota. It also involves taking the project lists generated by the Natural Flow Methods Committee and adding newly constructed projects or subtracting cancelled projects each year. The projects that met the criteria in 1993 are the benchmark for all future reporting.

5.2.2 Saskatchewan

In 1993, there were 137 minor projects in the Saskatchewan portion of the Souris River basin that met the new criteria. These projects had an annual diversion of 5 099 cubic decametres (4,134 acre-feet). On December 31, 2008, there were 139 minor projects in the Saskatchewan portion of the basin with an annual diversion of 4 824 cubic decametres (3,912 acre-feet). There were no new projects in 2010.

5.2.3 North Dakota

In 1993, there were 12 minor projects in the North Dakota portion of the Souris River basin upstream of Sherwood that met the new criteria. The projects had an annual diversion of 1 257 cubic decametres (1,019 acre-feet). On December 31, 2010, there were 12 minor projects in the North Dakota portion of the Long and Short Creek basins. The annual diversions totaled 1 423 cubic decametres (1,154 acre-feet).

The diversion from East Branch Short Creek near Columbus, North Dakota, was estimated by correcting for precipitation, evaporation and seepage, and the storage change. The diversion in 2010 was 701 cubic decametres (568 acre-feet). The diversion from the reservoir was added to the minor project diversions for the Long and Short Creek basins to obtain the total diversion of 2 124 cubic decametres (1,722 acre-feet) by the United States.

6.0 HYDROLOGIC CONDITIONS IN 2010

The Saskatchewan Watershed Authority forecasted normal to above normal runoff in all areas of the Souris River basin. Precipitation in the Saskatchewan portion of the basin was 100 percent to 150 percent of normal for the period November 1, 2009 to February 16, 2010. The National Weather Service reported that there was a risk of flooding upstream of Minot but there was a greater risk downstream of Minot. They reported the snowpack in the lower portion of the basin had five to seven inches of snow water equivalent. They expected the 1:10 year event triggers to be met. Manitoba Water Stewardship forecast the 2010 spring runoff to be above average. Soil moisture was near normal with well above average snowcover. However, from February through March, there was little additional precipitation in the basin.

The International Souris River Board members decided to hold a conference call on March 23 to discuss whether to declare 2010 a flood year. The Board decided that flood operations should be not be invoked.

The Corps of Engineers noted that there was cause for concern for the City of Minot. There was potential for flows from Lake Darling on the order of 42.5 to 56.6 cubic metres per second (1,500 to 2,000 cubic feet per second) at the same time as local runoff would be occurring below Lake Darling. However, due to dry antecedent conditions in the upper portions of the basin, reservoirs in both Saskatchewan and North Dakota were able to store most of the runoff. The Souris River at Sherwood did not exceed flood stage. Lake Darling was able to store all the runoff from the Souris River and its tributaries above the reservoir.

Flows in the Souris River basin in North Dakota were earlier than expected for the spring of 2010. The spring peak for the Souris River above Minot occurred on March 31, 2010 with a flow of 49 cubic metres per second (1,730 cubic feet per second). This flow ranked 34th out of 107 years of data. For much of the rest of the basin, the spring freshet peak flows were closer to or below mean annual peak flows. The April peak of 3.71 cubic metres per second (131 cubic feet per second) for Long Creek at Noonan gage ranked 39th in 51 years, while the April peak of 7.1 cubic metres per second (250 cubic feet per second) for the Souris River at Sherwood ranked 66th in 80 years of record. The spring peak flow for the Souris River near Westhope occurred on April 19, with a recorded flow of 27.7 cubic metres per second (979 cubic feet per second).

After spring runoff in Saskatchewan, significant rainfall amounts were recorded in the Saskatchewan and Manitoba portions of the basin. Significant June and July flows occurred on Long and Moose Mountain Creeks and the Souris River near Sherwood. Inflows continued to the reservoirs throughout the summer, ensuring that the Canadian reservoirs were full or close for full at the end of the summer. The annual peak flow at Sherwood was about 12.7 cubic metres per second (450 cubic feet per second) on June 25, which ranked 59th out of 80 years of record. For the 2010 calendar year, the peak flow of 46.4 cubic metres per second (1,640 cubic feet per second) for Westhope occurred on June 26. This peak ranks 58th in 81 years of record.

On December 31, 2010, Rafferty Reservoir was at an elevation of 549.56 metres (1802.56 feet) that was 0.710 metres (0.33 feet) higher than at the beginning of the year. Total inflow to Rafferty Reservoir in 2010 was 54 155 cubic decametres (43,903 acre-feet), and the calculated diversion for 2010 was 655 cubic decametres (531 acre-feet). No water was transferred from Rafferty Reservoir to Boundary Reservoir via the pipeline in 2010.

Releases were made from Alameda Reservoir from March through December in 2010. The main-stem inflow to Alameda Reservoir (Moose Mountain Creek above Alameda Reservoir) was 32 700 cubic decametres (26,510 acre-feet), and the calculated diversion for 2010 was 23 690 cubic decametres (19,205 acre-feet). Alameda Reservoir was at an elevation of 561.67 metres (1,842.28 feet) on December 31, 2010, or 0.71 metres (2.33 feet) more than at the beginning of the year.

Boundary Reservoir received an inflow of 33 196 cubic decametres (26,912 acre-feet) from Long Creek. The calculated diversion for 2010 was 16 130 cubic decametres (13,077 acre-feet). On December 31, 2010, Boundary Reservoir was at an elevation of 560.72 metres (1,839.16 feet), or 0.80 metres (2.62 feet) below Full Supply Level.

On December 31, 2010, the estimated storage in the five major reservoirs in Saskatchewan (Boundary, Rafferty, Alameda, Nickle Lake, and Moose Mountain Lake) was 582 990 cubic decametres (472,630 acre-feet) as compared to storage of 552 303 cubic decametres (447,752 acre-feet) on December 31, 2009. Figure 1 shows the storage contents of several reservoirs in the Canadian portion of the Souris River basin for 2009 and 2010.

Recorded runoff for the year for the Souris River near Sherwood was 99 522 cubic decametres (80,683 acre-feet), or about 91.3 percent of the 1931-2010 long-term mean. The artificially drained areas of Yellow Grass Ditch and Tatagwa Lake contributed 23 010 cubic decametres (18,654 acre-feet) during 2010. Figure 2 provides a schematic representation of recorded runoff above Sherwood, North Dakota.

On December 31, 2010, the level of Lake Darling was 486.55 metres (1,595.90 feet). The 2010 year-end storage in Lake Darling was 121 341 cubic decametres (98,371 acre-feet), or approximately 1 757 cubic decametres (1,424 acre-feet) more than on December 31, 2009. The 2010 year-end storage in the J. Clark Salyer Refuge pools was 52 020 cubic decametres (42,173 acre-feet), or 26 249 cubic decametres (21,280 acre-feet) less than on December 31, 2009. The combined year-end storage in Lake Darling and the J. Clark Salyer Refuge pools was 173 361 cubic decametres (140,544 acre-feet), well above the 66 600 cubic decametres (54,000 acre-feet) "severe drought" criterion. Figure 3 shows the storage contents of the main-stem reservoirs in the United States.

Recorded runoff for the year for the Souris River at Westhope was 469 520 cubic decametres (380,640 acre-feet) or some 369 998 cubic decametres (299,957 acre-feet) more than entered North Dakota at the Sherwood Crossing. The annual runoff for the Souris River near Westhope was 192 percent of the 1929-2010 long-term mean.

Figure 4 shows the monthly releases from Boundary, Rafferty, Alameda, and Lake Darling Reservoirs.

7.0 SUMMARY OF FLOWS AND DIVERSIONS

7.1 SOURIS RIVER NEAR SHERWOOD

The natural runoff near Sherwood for 2010 was 132 005 cubic decametres (107,016 acre-feet). Depletions in Canada totaled 53 369 cubic decametres (43,266 acre-feet). The additional water received from the Yellow Grass Ditch and Tatagwa Lake Drain basins was 23 010 cubic decametres (18,654 acre-feet). Total depletions in Canada were 30 359 cubic decametres (24,612 acre-feet) more than the additional water received from the Yellow Grass Ditch and Tatagwa Lake Drain basins. The total volume of water released from Boundary, Rafferty, and Alameda Reservoirs in Canada in 2010 was 81 906 cubic decametres (66,401 acre-feet), representing 82 percent of the recorded flow at Sherwood, or 62 percent of the computed natural runoff at Sherwood. A schematic representation of the 2010 flow volumes in the Souris River basin above Sherwood is shown in Figure 2 and the summary of the natural flow computations is provided in Appendix A. It should be noted that Saskatchewan was in surplus on December 31, 2010 by 48 846 cubic decametres (39,560 acre-feet).

The flow of the Souris River at Sherwood was more than 0.113 cubic metres per second (4 cubic feet per second) except during the winter periods of January 1 through March 11. During those periods when the flow was less than 0.113 cubic metres per second (4 cubic feet per second), the Province of Saskatchewan did not divert, store, or use any water above what would have occurred under conditions of water-use development prevailing in the Saskatchewan portion of the basin prior to the construction of Boundary Dam, Rafferty Dam, and Alameda Dam. Accordingly, Saskatchewan complied with the 0.113 cubic metres per second (4 cubic feet per second) provision specified in Recommendation No. 1 of the Interim Measures.

7.2 LONG CREEK AND SHORT CREEK

Recorded runoff for Long Creek at the Western Crossing as it enters North Dakota was 24 100 cubic decametres (19,538 acre-feet), or 94.8 percent of the long-term mean since 1959. Recommendation No. 2 of the Interim Measures was met with the increase of runoff on Long Creek between the Western and Eastern Crossings of 9 096 cubic decametres (7,374 acre-feet).

Short Creek, which rises in North Dakota, contributed 11 100 cubic decametres (8,999 acre-feet) to runoff in the Souris River above Sherwood.

7.3 SOURIS RIVER NEAR WESTHOPE

Recorded flow near Westhope during the period of June 1 through October 31, 2009, was 294 097 cubic decametres (238,424 acre-feet). Figure 5 illustrates the recorded flows at Westhope and at Wawanesa near the mouth of the Souris River in Manitoba.

Due to ice conditions the flows in the Souris River near Westhope were estimated for the periods January 1 to March 20 and November 17 to December 31. The peak daily discharge of 46.4 cubic metres per second (1,640 cubic feet per second) occurred on June 26, and ranked 30th in 81 years of discharge record.

The flow was in compliance with the 0.566 cubic metres per second (20 cubic feet per second) minimum flow requirement as specified in Recommendation No. 3(a) of the Interim Measures.

8.0 WORKPLAN SUMMARY FOR 2010

The International Souris River Board was created by the International Joint Commission in April 2000 when it combined responsibilities for the Souris River previously assigned in two separate References. The two were the International Souris River Board of Control Reference (1959) and the Souris-Red Rivers Engineering Board Reference (1948).

On June 9, 2005, the Board's mandate was changed further through an exchange of diplomatic notes, assigning water quality functions and the oversight for flood forecasting and operations to the Board. The consolidation of water quantity, water quality, and the oversight for flood forecasting and operations is a step in the evolution of the Board as it moves towards an integrated approach to transboundary water issues in the Souris River basin.

The Board determined that a workplan would be beneficial in helping the Board identify resource requirements and deliver on results. The Board agreed that the workplan should include costs related to normal Board activities such as meetings, the annual report, and special projects.

A multi-year workplan was developed for 2008-2009 and was updated for 2009-2010. The workplan follows the four strategic initiatives of the International Watershed Initiative.

- Build shared understanding of the watershed and related transboundary issues.
- Communicate watershed issues at the local, regional and national levels to increase awareness, highlight potential issues, and identify opportunities for cooperation and resolution.
- Contribute to the resolution of watershed issues.
- Administer the existing orders and references.

The Board also approved a review of the water quality monitoring program as per its workplan and submitted a proposal to the IJC's International Watershed Initiative. It was suggested that the review of the water quality monitoring program involve all agencies, as water quality monitoring in the United States portion of the Souris River basin is funded jointly by the United States Army Corps of Engineers and the United States Fish and Wildlife Service.

Figure 1

MONTH END CONTENTS OF RESERVOIRS IN CANADA FOR THE YEARS 2009 AND 2010

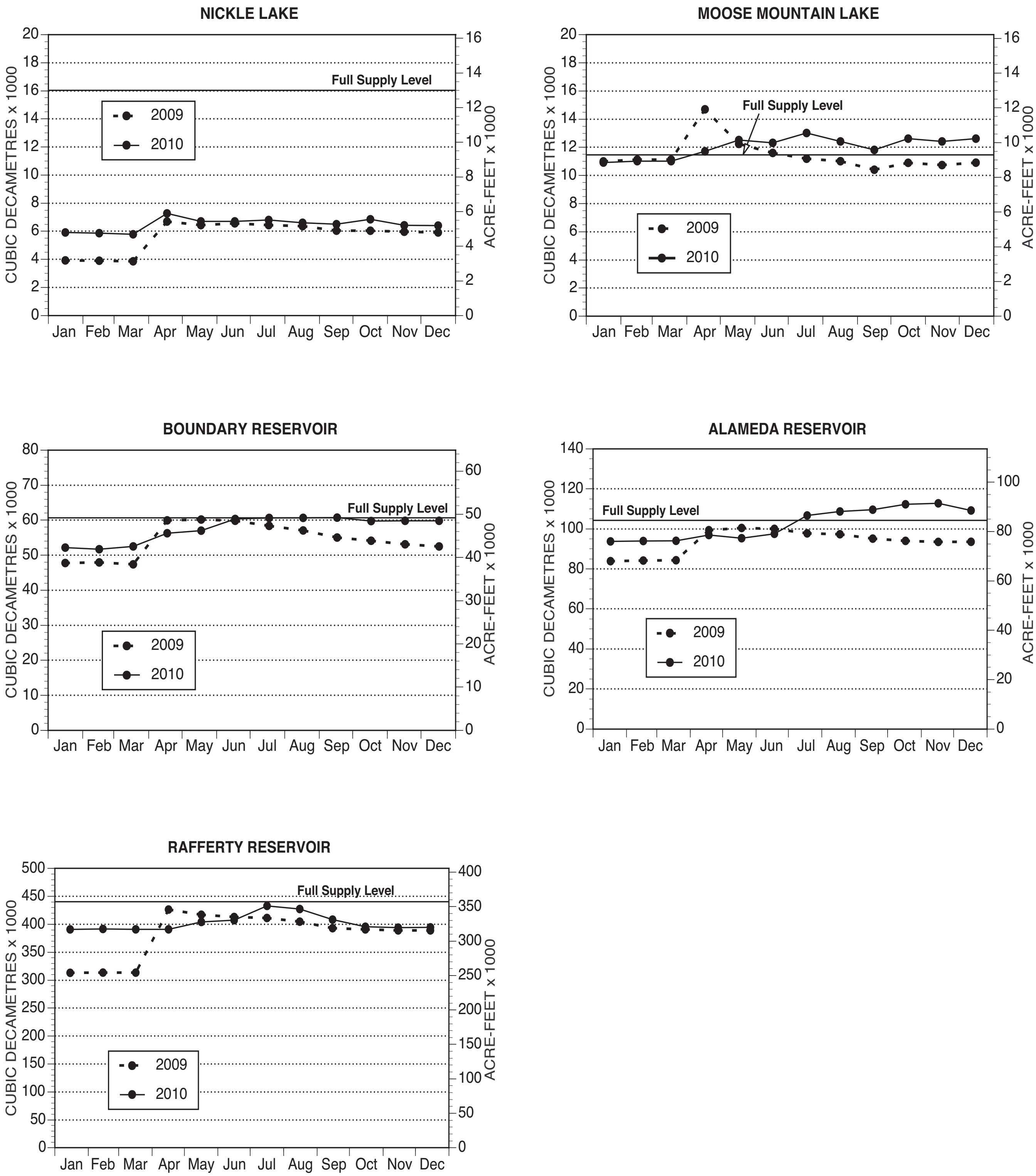


Figure 2

SCHEMATIC REPRESENTATION OF 2010 FLOWS IN THE SOURIS RIVER BASIN ABOVE SHERWOOD, NORTH DAKOTA, U.S.A.

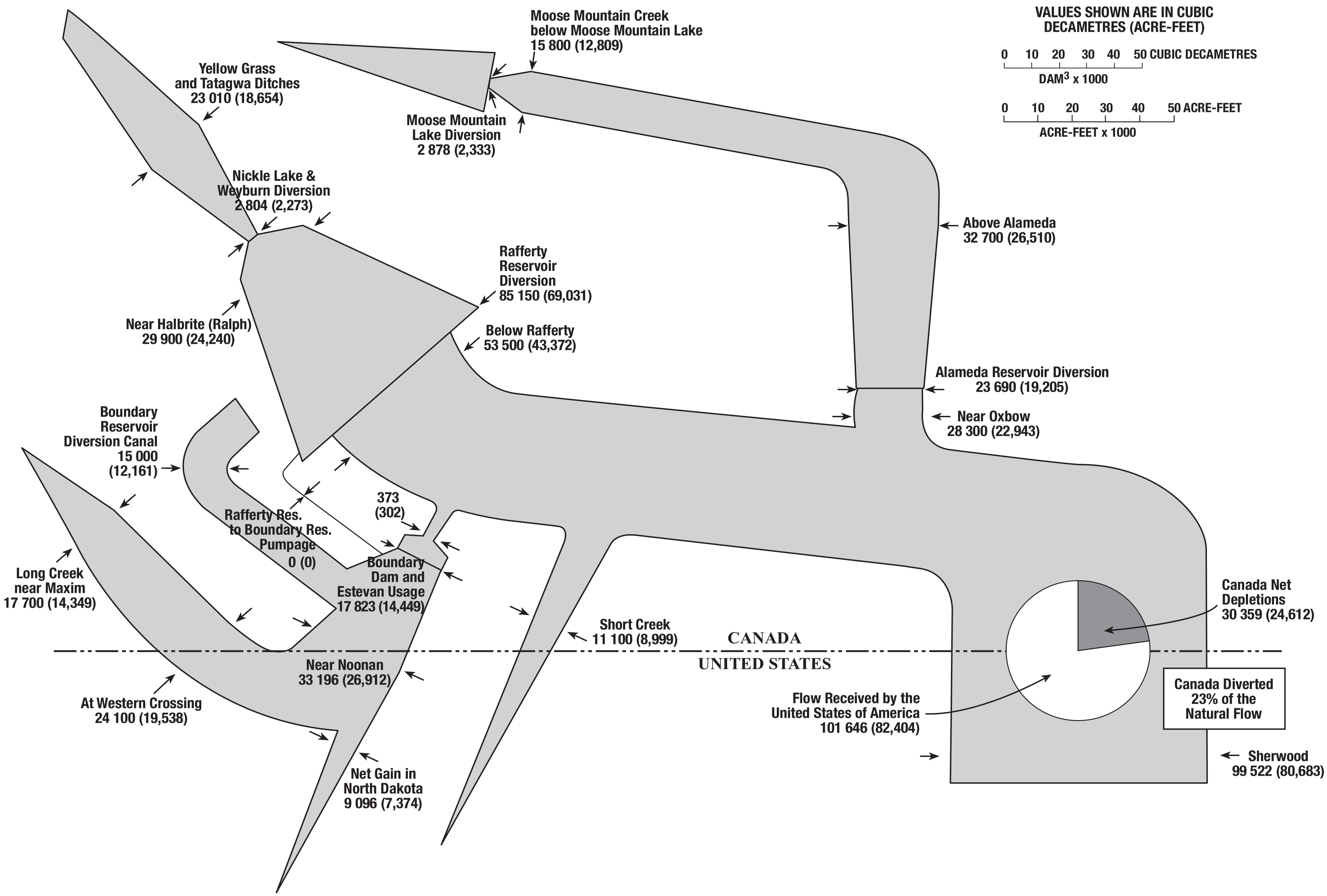


Figure 3

MONTH END CONTENTS OF RESERVOIRS IN USA FOR THE YEARS 2009 AND 2010

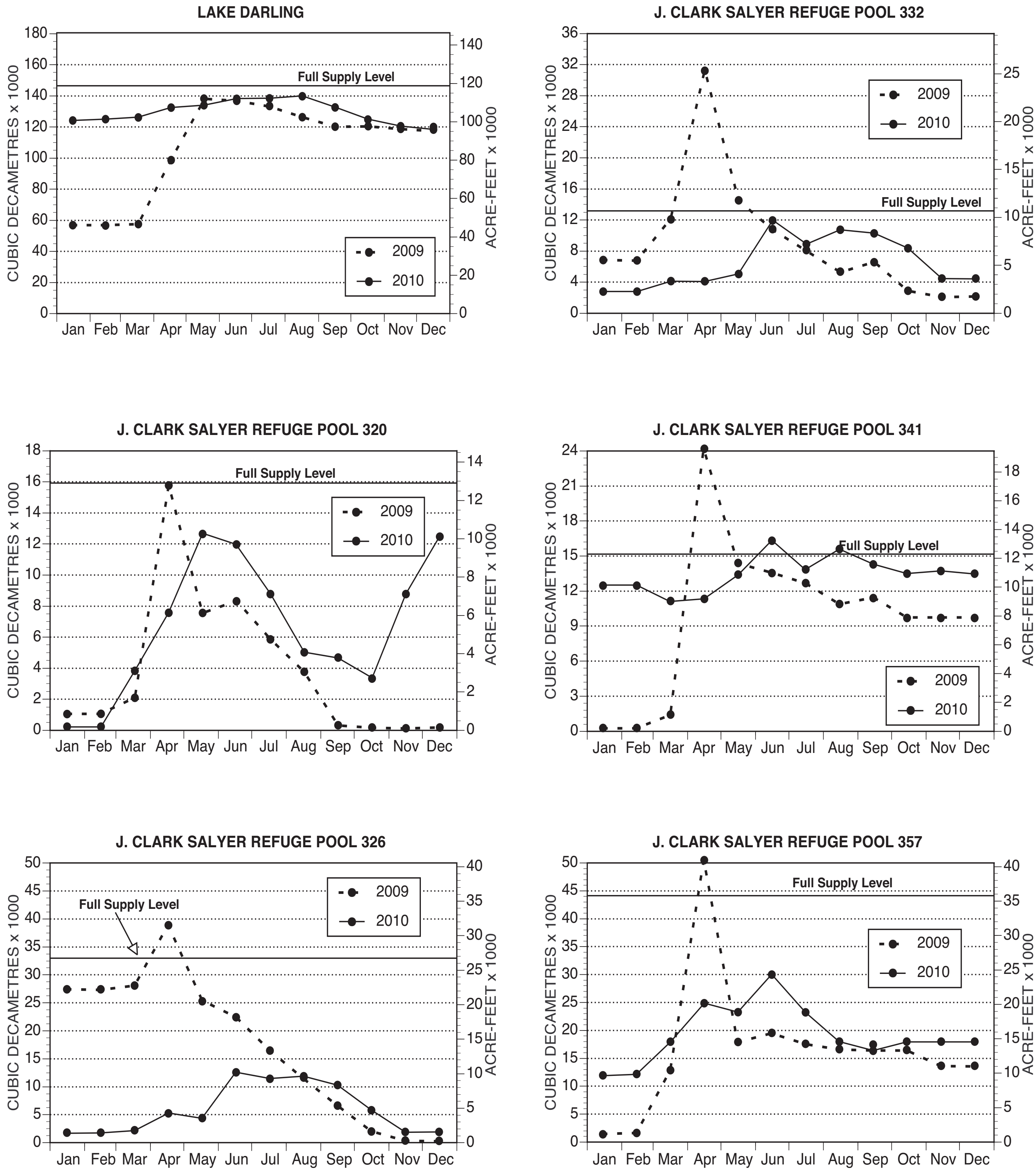
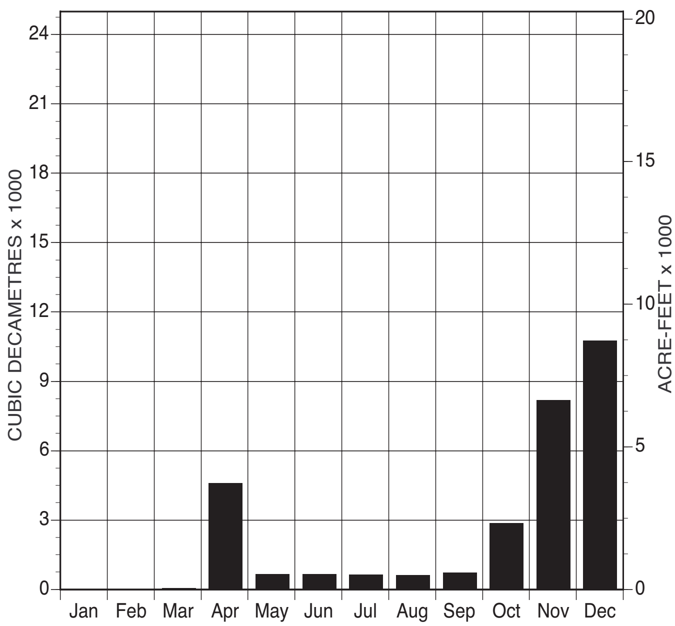


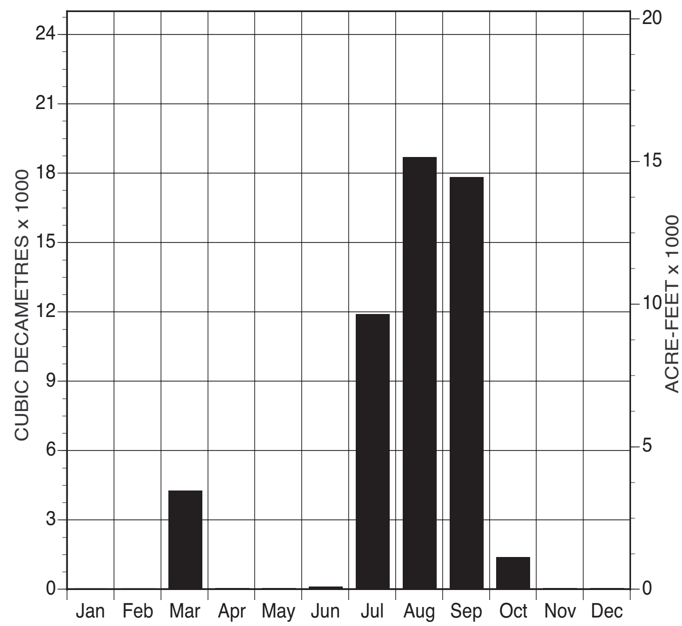
Figure 4

MONTHLY RESERVOIR RELEASES FOR THE YEAR 2010

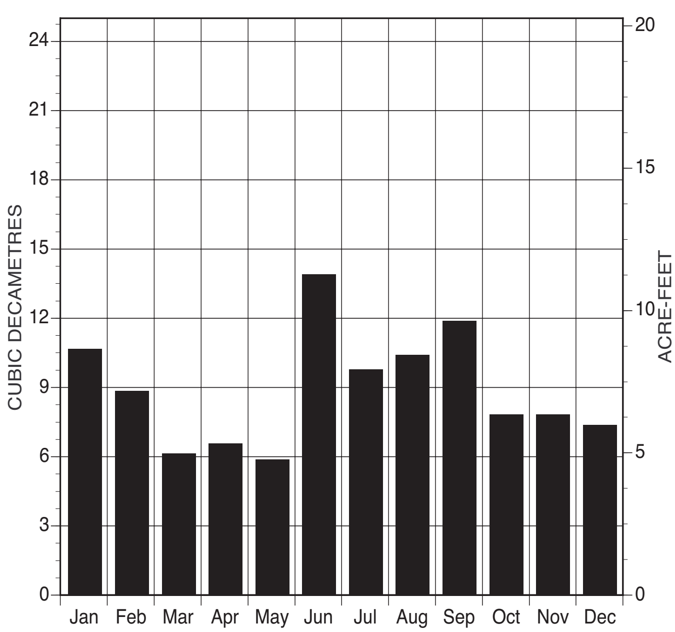
ALAMEDA DAM



RAFFERTY DAM



BOUNDARY DAM



LAKE DARLING DAM

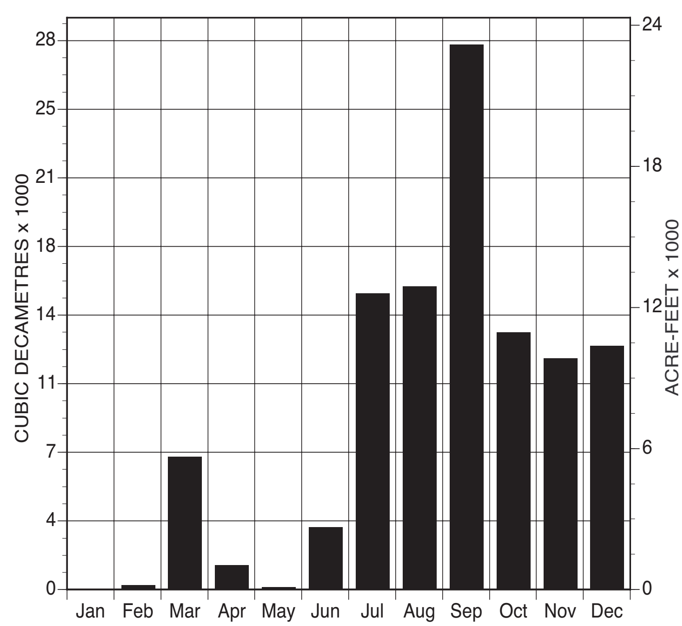
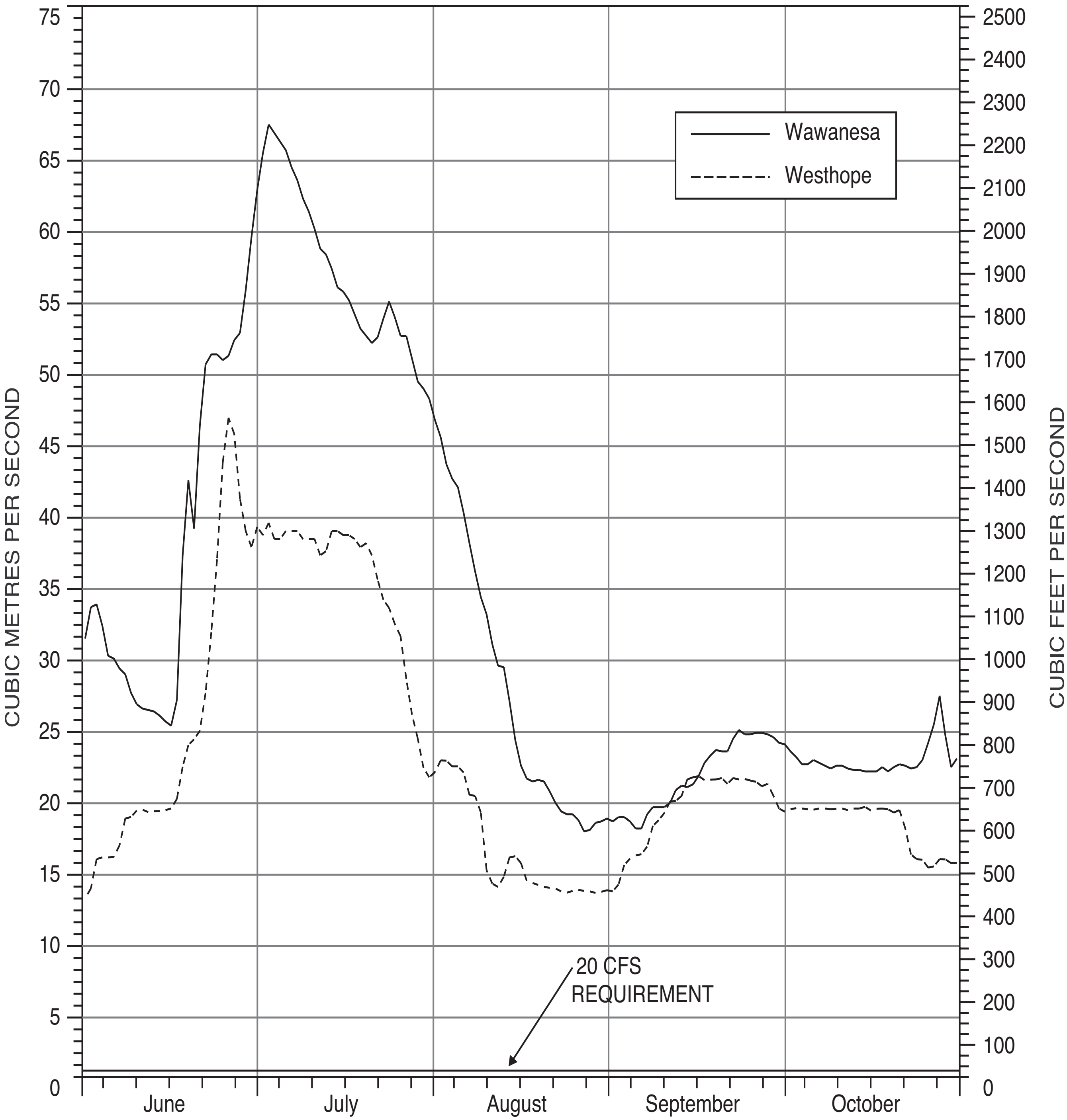


Figure 5

SOURIS RIVER NEAR WESTHOPE
AND
SOURIS RIVER NEAR WAWANESA

June 1, 2010 to October 31, 2010




International Joint Commission • Commission Mixte Internationale
1909
Map of the Souris River Drainage Basin
0 5 10 15 20
Miles
0 10 20 30 40
Kilometres
North
Legend
Souris River Basin
Indian / Native Reserve
Provincial Park
US Fish and Wildlife
Gauging Stations
City
Town, Village
Highway
River
Lake or Reservoir
Datum: NAD 1983
Projection: Lambert Conformal Conic
Latitude of Origin: 49'
Central Meridian: -104'
Standard Parallel 1: 49'
Standard Parallel 2: 77'
Date: October 2007
Contact: M.R. Gilchrist, 306-780-6411
Environment Canada
SASKATCHEWAN
MANITOBA
MONTANA
NORTH DAKOTA
Regina
Weyburn
Estevan
Brandon
Minot
Williston
Bottineau
Rugby
Devils Lake
Sidney
Saskatchewan
Manitoba
Canada
U.S.A.
Montana
North Dakota

APPENDIX A

Determination of Natural Flow of Souris River at International Boundary (Sherwood)

DETERMINATION OF NATURAL FLOW OF SOURIS RIVER AT INTERNATIONAL BOUNDARY (SHERWOOD)

All Quantities Reported In Cubic Decametres

FOR THE PERIOD: JANUARY 1 TO DEC 31, 2010

LONG CREEK BASIN												
LARSEN RESERVOIR				BOUNDARY RESERVOIR								
				INFLOW	OUTFLOW							
1	2	3	4	5 *	6	7	8	9	10	11	12 *	13
STORAGE CHANGE	EVAPORATION	DIVERSION	TOWN OF RADVILLE PUMPAGE	LONG CREEK AT EASTERN CROSSING	LONG CREEK NEAR ESTEVAN	ESTEVAN PIPELINE	DIVERSION CANAL	TOTAL (OUTFLOW)	DIVERSION	MINOR PROJECT DIVERSION	U.S.A. DIVERSION BETWEEN WESTERN & EASTERN CROSSING	TOTAL DIVERSION LONG CREEK
				33196								
90	166	256 (1+2)	30	0 PIPELINE	105	1961	15000	17066 (6+7+8)	16130 (5-9)	840	403	17659 (3+4+10+11+12)

UPPER SOURIS RIVER BASIN - ABOVE ESTEVAN												
NICKLE LAKE RESERVOIR					ROUGHBARK RESERVOIR			RAFFERTY RESERVOIR				
14	15	16	17	18	19	20	21	22	23	24	25	26
STORAGE CHANGE	EVAPORATION	CITY OF WEYBURN PUMPAGE	DIVERSION	CITY OF WEYBURN RETURN FLOW	STORAGE CHANGE	EVAPORATION	DIVERSION	INFLOW	OUTFLOW	DIVERSION	MINOR PROJECT DIVERSION	TOTAL DIVERSION UPPER SOURIS RIVER
									53500			
980	1740	1636	4356 (14+15+16)	1552	165	238	403 (19+20)	54155	0 PIPELINE	655 (22-23)	1540	5402 (17-18+21+24+25)

LOWER SOURIS RIVER--ESTEVAN TO SHERWOOD			
27	28 *	29	30
CITY OF ESTEVAN NET PUMPAGE	SHORT CREEK DIVERSIONS IN U.S.A.	MINOR PROJECT DIVERSION	TOTAL DIVERSION LOWER SOURIS RIVER
1693	1721	1000	4414 (27+28+29)

MOOSE MOUNTAIN CREEK BASIN							
MOOSE MOUNTAIN LAKE			ALAMEDA RESERVOIR				
31	32	33	34	35	36	37	38
STORAGE CHANGE	EVAPORATION	DIVERSION	STORAGE CHANGE	EVAPORATION	DIVERSION	MINOR PROJECT DIVERSIONS	TOTAL DIVERSIONS MOOSE MOUNTAIN CREEK BASIN
1462	1416	2878 (31+32)	21263	2427	23690 (34+35)	1450	28018 (33+36+37)

NON-CONTRIBUTORY BASINS		
39	40	41
YELLOW GRASS DITCH	TATAGWA LAKE DRAIN	TOTAL ADDITIONS
18600	4410	23010 (39+40)

* DATA CONTRIBUTED BY U.S.G.S.

SUMMARY OF NATURAL FLOW					
42	43 *	44	45	46	47
TOTAL DIVERSION SOURIS RIVER BASIN	RECORDED FLOW AT SHERWOOD	NATURAL FLOW AT SHERWOOD	U.S.A. SHARE	FLOW RECEIVED BY U.S.A.	SURPLUS (+) OR DEFICIT (-) TO U.S.A.
			40% OF 44 52800		(46-45) 40% SHARE 48846
55493 (13+26+30+38)	99522	132005 (42+43-41)	50% OF 44	101646 (12+28+43)	(46-45) 50% SHARE

RECOMMENDATION - SECTION 2 ANNUAL FLOW OF LONG CREEK		
48	49 *	50
RECORDED FLOW AT WESTERN CROSSING	RECORDED FLOW AT EASTERN CROSSING	SURPLUS (+) OR DEFICIT (-) FROM U.S.A.
24100	33196	9096 (49-48)

APPENDIX B

Equivalents of Measurements

EQUIVALENTS OF MEASUREMENTS

The following is a list of equivalents of measurement that have been agreed to for use in reports of the International Souris River Board.

1 centimetre equals 0.39370 inch
1 metre equals 3.2808 feet
1 kilometre equals 0.62137 mile

1 hectare equals 10 000 square metres
1 hectare equals 2.4710 acres
1 square kilometre equals 0.38610 square mile

1 cubic metre per second equals 35.315 cubic feet per second

The metric (SI) unit that replaces the British acre-foot unit is the cubic decametre (dam^3), which is the volume contained in a cube 10 m x 10 m x 10 m or 1 000 cubic metres.

1 cubic decametre equals 0.81070 acre-feet
1 cubic metre per second flowing for 1 day equals 86.4 cubic decametres
1 cubic foot per second flowing for 1 day equals 1.9835 acre-feet

APPENDIX C

Interim Measures as Modified in 2000

INTERIM MEASURES AS MODIFIED IN 2000

APPENDIX A TO THE DIRECTIVE TO THE INTERNATIONAL SOURIS RIVER BOARD

1. The Province of Saskatchewan shall have the right to divert, store, and use waters which originate in the Saskatchewan portion of the Souris River basin, provided that such diversion, storage, and use shall not diminish the annual flow of the river at the Sherwood Crossing more than 50 percent of that which would have occurred in a state of nature, as calculated by the International Souris River Board. For the purpose of these calculations, any reference to "annual" and "year" is intended to mean the period January 1 through December 31.

   For the benefit of riparian users of water between the Sherwood Crossing and the upstream end of Lake Darling, the Province of Saskatchewan shall, so far as is practicable, regulate its diversions, storage, and uses in such a manner that the flow in the Souris River channel at the Sherwood Crossing shall not be less than 0.113 cubic metre per second (4 cubic feet per second) when that much flow would have occurred under the conditions of water use development prevailing in the Saskatchewan portion of the Souris River basin prior to construction of the Boundary Dam, Rafferty Dam, and Alameda Dam.

   Under certain conditions, a portion of the North Dakota share will be in the form of evaporation from Rafferty and Alameda Reservoirs. During years when these conditions occur, the minimum amount of flow actually passed to North Dakota will be 40 percent of the annual natural flow volume at the Sherwood Crossing. This lesser amount is in recognition of Saskatchewan's operation of Rafferty Dam and Alameda Dam for flood control in North Dakota and of evaporation as a result of the project.

   a. Saskatchewan will deliver a minimum of 50 percent of the annual natural flow volume at the Sherwood Crossing in every year except in those years when the conditions given in (i) or (ii) below apply. In those years, Saskatchewan will deliver a minimum of 40 percent of the annual natural flow volume at the Sherwood Crossing.

      i. The annual natural flow volume at Sherwood Crossing is greater than 50 000 cubic decametres (40,500 acre-feet) and the current year June 1 elevation of Lake Darling is greater than 486.095 metres (1594.8 feet); or

      ii. The annual natural flow volume at Sherwood Crossing is greater than 50 000 cubic decametres (40,500 acre-feet) and the current year June 1 elevation of Lake Darling is greater than 485.79 metres (1593.8 feet), and since the last occurrence of a Lake Darling June 1 elevation of greater than 486.095 metres (1594.8 feet) the elevation of Lake Darling has not been less than 485.79 metres (1593.8 feet) on June 1.

   b. Notwithstanding the annual division of flows that is described in (a), in each year Saskatchewan will, so far as is practicable as determined by the Board, deliver to North Dakota prior to June 1, 50 percent of the first 50 000 cubic decametres (40,500 acre-feet) of natural flow which occurs during the period January 1 to May 31. The intent of this division of flow is to ensure that North Dakota receives 50 percent of the rate and volume of flow that would have occurred in a state of nature to try to meet existing senior water rights.

c. Lake Darling Reservoir and the Canadian reservoirs will be operated (insofar as is compatible with the Projects' purposes and consistent with past practices) to ensure that the pool elevations, which determine conditions for sharing evaporation losses, are not artificially altered. The triggering elevation of 485.79 metres (1593.8 feet) for Lake Darling Reservoir is based on existing water uses in North Dakota, including refuges operated by the U.S. Fish and Wildlife Service. Each year, operating plans for the refuges on the Souris River will be presented to the Board. Barring unforeseen circumstances, operations will follow said plans during each given year. Lake Darling Reservoir will not be drawn down for the sole purpose of reaching the elevation of 485.79 metres (1593.8 feet) on June 1.

   Releases will not be made by Saskatchewan Watershed Authority from the Canadian reservoirs for the sole purpose of raising the elevation of Lake Darling Reservoir above 486.095 metres (1594.8 feet) on June 1.

d. Flow releases to the United States should occur (except in flood years) in the pattern which would have occurred in a state of nature. To the extent possible and in consideration of potential channel losses and operating efficiencies, releases from the Canadian dams will be scheduled to coincide with periods of beneficial use in North Dakota. Normally, the period of beneficial use in North Dakota coincides with the timing of the natural hydrograph, and that timing should be a guide to releases of the United States portion of the natural flow.

e. A determination of the annual apportionment balance shall be made by the Board on or about October 1 of each year. Any shortfall that exists as of that date shall be delivered by Saskatchewan prior to December 31.

f. The flow release to the United States may be delayed when the State of North Dakota determines and notifies Saskatchewan through the Board that the release would not be of benefit to the State at that time. The delayed release may be retained for use in Saskatchewan, notwithstanding the 0.113 cubic metre per second (4 cubic feet per second) minimum flow limit, unless it is called for by the State of North Dakota through the Board before October 1 of each year. The delayed release shall be measured at the point of release and the delivery at Sherwood Crossing shall not be less than the delayed release minus the conveyance losses that would have occurred under natural conditions between the point of release and the Sherwood Crossing. Prior to these releases being made, consultations shall occur between the Saskatchewan Watershed Authority, the U.S. Fish and Wildlife Service, and the State of North Dakota. All releases will be within the specified target flows at the control points.

2. Except as otherwise provided herein with respect to delivery of water to the Province of Manitoba, the State of North Dakota shall have the right to divert, store, and use the waters which originate in the North Dakota portion of the Souris River basin together with the waters delivered to the State of North Dakota at the Sherwood Crossing under Recommendation (1) above; provided, that any diversion, use, or storage of Long Creek water shall not diminish the annual flow at the eastern crossing of Long Creek into Saskatchewan below the annual flow of said Creek at the western crossing into North Dakota.

3. (a) In addition to the waters of the Souris River basin which originate in the Province of Manitoba, that Province shall have the right, except during periods of severe drought, to receive for its own use and the State of North Dakota shall deliver from any available source during the months of June, July, August, September, and October of each year, six thousand and sixty-nine (6,069) acre-feet of water at the Westhope Crossing regulated so far as practicable at the rate of twenty (20) cubic feet per second except as set forth hereinafter: provided, that in delivering such water to Manitoba no account shall be taken of water crossing the boundary at a rate in excess of the said 20 cubic feet per second.

   (b) In periods of severe drought when it becomes impracticable for the State of North Dakota to provide the foregoing regulated flows, the responsibility of the State of North Dakota in this connection shall be limited to the provision of such flows as may be practicable, in the opinion of the said Board of Control, in accordance with the objective of making water available for human and livestock consumption and for household use. It is understood that in the circumstances contemplated in this paragraph the State of North Dakota will give the earliest possible advice to the International Souris River Board of Control with respect to the onset of severe drought conditions.

4. In event of disagreement between the two sections of the International Souris River Board of Control, the matters in controversy shall be referred to the Commission for decision.

5. The interim measures for which provision is herein made shall remain in effect until the adoption of permanent measures in accordance with the requirements of questions (1) and (2) of the Reference of January 15, 1940, unless before that time these interim measures are qualified or modified by the Commission.

APPENDIX D

Board Directive from January 18, 2007

DIRECTIVE TO THE INTERNATIONAL SOURIS RIVER BOARD

The International Souris River Board was created by the International Joint Commission in April 2000 when it amalgamated the Souris River basin responsibilities previously assigned to the Commission in two separate references by the governments of Canada and the United States. The two references were the International Souris River Board of Control Reference (1959) and the Souris-Red Rivers Engineering Board Reference (1948). The International Souris River Board's mandate changed further through an exchange of diplomatic notes on June 9, 2005 assigning water quality functions and the oversight for flood forecasting and operations as described in Section 4 below. The consolidation of water quantity, water quality, and the oversight for flood forecasting and operations is a step in the evolution of the International Souris River Board as it moves towards an integrated approach to transboundary water issues in the Souris River basin.

This directive replaces the April 11, 2002 Directive to the International Souris River Board and sets out the mandate under which the Board will operate.

1. Pursuant to the Boundary Waters Treaty of 1909 and related agreements, responsibilities have been conferred on the Commission to ensure compliance with apportionment measures for the waters of the Souris River, to investigate and report on water requirements and uses as they impact the transboundary waters of the Souris River basin, and to assist in the implementation and review of the Joint Water Quality Monitoring Program pursuant to the 1989 Canada-United States Agreement for Water Supply and Flood Control in the Souris River Basin.

2. The apportionment measures derive from the approvals given by the governments of Canada and the United States, by letters of March 20, 1959 and April 3, 1959 respectively, to the recommendations made by the Commission in paragraph 22 of its report to the governments of March 19, 1958. Subsequently, with the signing of the Canada-United States Agreement for Water Supply and Flood Control in the Souris River basin on October 26, 1989 (hereafter referred to as the 1989 Agreement), the Interim Measures for apportionment of the Souris River at the Saskatchewan-North Dakota boundary were revised as described in Annex B of the 1989 Agreement. By letters of February 28, 1992, the Commission was requested to monitor compliance with the measures as modified in the 1989 Agreement. By letters of December 20 and 22, 2000, the governments amended Annex B of the 1989 Agreement. The attached Appendix A is a consolidation of the apportionment measures against which the Commission is to monitor compliance.

3. By letters of January 12, 1948, the governments requested the Commission to undertake investigations of water requirements and uses arising out of existing dams and other works or projects in the mid-continent portion of the Canada-United States boundary, including the Souris River basin, and to make advisory recommendations.

4. By exchange of diplomatic notes between the governments of Canada and the United States dated January 14 and June 9, 2005, the 1989 Canada-United States Agreement for Water Supply and Flood Control in the Souris River Basin was formally revised to include a reference pursuant to Article IX of the Boundary Waters Treaty which assigned water quality responsibilities contained in the 1989 Agreement to the Commission. The Commission was requested to assist with the implementation and review of the Joint Water Quality Monitoring Program. On October 21, 2005 at the October 2005 Commission's meeting with governments, the U.S. State Department read a statement into the Commission's formal record that the U.S. State Department is of the opinion the Commission has the authority and has obtained the notification it needs from the U.S. State Department to proceed with carrying out the flood related responsibilities for the Souris River. On April 6, 2006 at the April 2006 Commission's meeting with governments, the Department of Foreign Affairs and International Trade indicated that the Board should be assigned these responsibilities. It is recognized that Article X of the 1989 Canada-United States Agreement for Water Supply and Flood Control in the Souris River basin designates the entities responsible for operation and maintenance of the improvements mentioned in the 1989 Agreement and that the operations will be in accordance with the Operating Plan shown in Annex A of the 1989 Agreement. The Department of Army is the entity designated responsible for flood operations within the United States. The Government of Saskatchewan is the Canadian entity designated responsible for flood operations within the Canadian Province of Saskatchewan.

5. The Board's mandate is to support the Commission's initiative to explore and encourage the development of local and regional capacity with the objective of preventing and resolving transboundary disputes regarding the waters and aquatic ecosystem of the Souris River and its tributaries and aquifers. This would be accomplished through the application of best available science and knowledge of the aquatic ecosystem of the basin and an awareness of the needs, expectations and capabilities of residents of the Souris River basin. The Board's mandate will be accomplished by performing the tasks identified in Clause 6 below.

6. The Board's duties shall be to:

   (i) Maintain an awareness of existing and proposed developments, activities, conditions, and issues in the Souris River basin that may have an impact on transboundary water levels, flows, water quality, and aquatic ecosystem health and inform the Commission about existing or potential transboundary issues.

   (ii) Oversee the implementation of compliance with the Interim Measures As Modified For Apportionment of the Souris River as described in Appendix A of this document by:
   - identifying an adequate hydro-climatic monitoring network to support the determination of natural flow and apportionment balance,
   - encouraging the appropriate authorities to establish and maintain hydro-climatic monitoring and information collection networks and reporting

systems to ensure suitable information is available as required for the determination of natural flow and apportionment balance,
- informing the Commission, in a timely manner, of critical water supply or flow conditions in the basin,
- encouraging appropriate authorities to take steps to ensure that apportionment measures are met, and
- preparing an annual report and submitting it to the Commission.

(iii) Assist the Commission in the review of a Joint Water Quality Monitoring Program (referred to hereafter as "the Program") by:

- developing recommendations on the Program and the setting of water quality objectives,
- exchanging data provided by the Program on a regular basis,
- collating, interpreting, and analyzing the data provided by the Program,
- reviewing the Program and the water quality objectives at least every five years and developing recommendations, as appropriate, to the Commission to improve the Program and the objectives, and
- preparing an annual report containing:
    - a summary of the principal activities of the Board during the year with respect to the Program,
    - a summary of the principal activities affecting water quality in the Souris River Basin during the year,
    - a summary of the collated, interpreted, and analyzed data provided by the Program,
    - a summary of the water quality of the Souris River at the two locations at which it crosses the International Boundary,
    - a section summarizing any definitive changes in the monitored parameters and the possible causes of such changes,
    - a section discussing the water quality objectives for the Souris River at the Saskatchewan/North Dakota boundary and at the North Dakota/Manitoba boundary as established and revised pursuant to the 1989 Agreement,
    - a section summarizing other significant water quality changes and the possible causes of such changes, and
    - recommendations on new water quality objectives or on how existing water quality objectives can be met, including suggestions on water quality as it relates to water quantity during periods of low flow, in the event that the annual report indicates that the water quality objectives have not been attained as a result of activities pursued under the 1989 Agreement.

(iv) Perform an oversight function for flood operations in cooperation with the designated entities identified in the 1989 Canada-United States Agreement for Water Supply and Flood Control in the Souris River Basin by:

- ensuring mechanisms are in place for coordination of data exchange, flood forecasts and communications related to flood conditions and operations;
- determining whether the operations under the 1989 Agreement should proceed based on the Flood Operation or Non-Flood Operation of the Operating Plan, which is Annex A to the 1989 Agreement, using its criteria and informing designated agencies of this determination;
- reporting to the Commission on any issues related to flood operations and management; and
- providing the Commission and the designated entities under the 1989 Agreement recommendations on how flood operations and coordination activities could be improved.

(v) Report on aquatic ecosystem health issues in the watershed, regularly informing the Commission on the state and implications of aquatic ecosystem health, and encourage the appropriative authorities to establish and maintain water quality and other monitoring and information collection networks and reporting systems to ensure suitable information is available as required for the determination of the health of the aquatic ecosystem.

(vi) Carry out such other studies or activities as the Commission may, from time to time, request.

(vii) Prepare an annual work plan including both routine board activities and new initiatives planned to be conducted in the subsequent year. The work plan shall be submitted annually to IJC for review.

7. The Board shall provide opportunities for the public to be involved in its work, including at least one public meeting in the basin each year.

8. The Board shall coordinate and collaborate with other agencies and institutions both within and outside the Souris River basin as may be needed or desirable, and facilitate the timely dissemination of pertinent information within the basin. The Board shall keep the Commission informed of these activities.

9. The Board shall have an equal number of members from each country. The Commission shall normally appoint each member for a three-year term. Appointments may be renewed for additional terms. Members shall act in their personal and professional capacity, and not as representatives of their countries, agencies or institutions. The Commission shall appoint Canadian and United States co-chairs of the Board and will strive to appoint chairs with complementary expertise that encompasses a broad spectrum of basin issues.

10. The co-chairs of the Board shall be responsible for maintaining proper liaison between the Board and the Commission, and among the Board members.

11. The co-chairs shall ensure that members of the Board are informed of all instructions, inquiries, and authorizations received from the Commission and also of activities undertaken by or on behalf of the Board, progress made, and any developments affecting such progress.

12. The co-chairs may appoint secretaries of the Board who, under the general supervision of the co-chairs, shall carry out such duties as are assigned by the co-chairs or the Board as a whole.

13. The Board may establish such committees and working groups as may be required to fulfill its responsibilities in a knowledgeable and effective manner. The Commission shall be kept informed of the duties and composition of any committee or working group.

14. Unless other arrangements are made with the Commission, members of the Board, committees, or working groups shall make their own arrangements for reimbursement of necessary expenditures for travel or other related expenses.

15. The Board shall inform the Commission in advance of plans for any meetings, or other means of involving the public in Board deliberations, and shall report to the Commission, in a timely manner, on these and any other presentations or representations made to the Board.

16. The Board shall conduct its public outreach activities in accordance with the Commission's public information policies and shall maintain files in accordance with the Commission policy on segregation of documents.

17. Prior to their release, the Board shall provide the text of media releases and other public information materials to the Secretaries of the Commission for review by the Commission's Public Information Officers.

18. The Board shall submit an annual report covering all of its activities, including the annual report regarding the Program and the work plan, as described in Section 6 above, to the Commission, at least three weeks in advance of the Commission's fall semi-annual meeting, and the Board shall submit other reports as the Commission may request or the Board may feel appropriate in keeping with this Directive. Reports shall be submitted in a format suitable for public release and electronic copies shall be provided to each of the Commission's section offices.

19. Reports, including annual reports, minutes and correspondence of the Board shall, normally, remain privileged and be available only to the Commission and to members of the Board and its committees until their release has been authorized by the Commission. The Board shall provide minutes of Board meetings to the Commission within 45 days of the close of the meeting in keeping with the Commission's April 2002 Policy Concerning Public Access to Minutes of Meetings. The minutes will subsequently be put on the Commission's web site.

20. If, in the opinion of the Board or of any member, any instruction, directive, or authorization received from the Commission lacks clarity or precision, the matter shall be referred promptly to the Commission for appropriate action.

21. The Board shall operate by consensus. In the event of any disagreement among the members of the Board which they are unable to resolve, the Board shall refer the matter forthwith to the Commission for decision.

22. The Commission may amend existing instructions or issue new instructions to the Board at any time.

Signed this 18th day of January, 2007

Elizabeth C. Bourget
Elizabeth Bourget
Secretary
United States Section

Murray Clamen
Secretary
Canadian Section

APPENDIX E

Water Quality Data for Sherwood and Westhope

ANNUAL WATER QUALITY OBJECTIVES SUMMARY
SOURIS RIVER – NORTH DAKOTA/SASKATCHEWAN BOUNDARY 2010 (Jan 1- Dec 31)
STATION 05114000 SHERWOOD USGS

WATER QUALITY PARAMETER	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA* Median (max-min)#samples	ANNUAL DATA Median (max-min)#samples	PERCENT EXCEEDANCE
Biological Parameters					
Fecal Coliform	200/100 ml	#/100 ml	30 (8,300-<1) 196	NDA	0
Inorganic Parameters					
Ammonia (un-ionized as N)	****	mg/L	0.001 (0.025-<0.001) 214	NDA	0
Chloride	100	mg/L	47 (220-4) 317	35.5(90.7-16.9) 5	0
Fluoride	1.5	mg/L	0.2 (1.8-<0.1) 317	0.29 (0.30-0.18) 5	0
NO_2 + NO_3(as N)dissolved	1.0	mg/L	0.1 (1.4-<0.01) 279	<0.04 (0.07-<0.04) 5	0
Phosphorus(total P)	0.10	mg/L	0.18(1.9-0.02)356	0.14 (0.31-0.08) 5	80
Sodium	100	mg/L	120 (532-14) 315	91 (184-80) 5	40
Sulfate	450	mg/L	230 (1,000-45) 317	246 (298-163) 5	0
Arsenic (total)	50	µg/L	<5.0 (28.3-<5) 151	5.8 (7.4-<5) 5	0
Barium(total)	1,000	µg/L	100 (300-15)150	95 (107-19) 5	0
Boron(total)	500	µg/L	210 (3,500-40) 148	305 (349-142) 5	0
Beryllium(total)	100	µg/L	<10 (43-<10) 150	<10 (<10) 5	0
Cadmium(total)	***27	µg/L	<1 (2-<1) 149	<1 (<1) 5	0
Chromium(total)	50	µg/L	<1(30-<1) 149	<1 (1.1-<1) 5	0

***based on hardness of 300 mg/L
****unionized ammonia is calculated using temperature and pH
NDA: No Data Available

ANNUAL WATER QUALITY OBJECTIVES SUMMARY
SOURIS RIVER – NORTH DAKOTA/SASKATCHEWAN BOUNDARY 2010 (Jan 1- Dec 31)
STATION 05114000 SHERWOOD USGS

WATER QUALITY PARAMETER	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA Median (max-min)#samples	ANNUAL DATA Median (max-min)#samples	PERCENT EXCEEDANCE
Cobalt(total)	0.05	mg/L	1 (3-<1) 149	<1 (<1) 5	0
Copper(total)	***30	µg/L	2.4 (20-<1) 143	1.3 (2.0-<1) 5	0
Iron(total)	300	µg/L	510 (10,000- 16) 158	306 (1,140-140) 5	60
Lead(total)	***13	µg/L	<2 (7-<2) 143	<2 (<2) 5	0
Mercury	0.5 ug/g in fish flesh	µg/g	NDA	NDA	NDA
Molybdenum(total)	10	µg/L	2.5 (45-<1) 150	4.4 (10.4 -2.7) 5	20
Nickel(total)	***220	µg/L	4 (17-1) 164	3.3 (4.1-2.1) 5	0
Selenium(total)	5	µg/L	<1(14 -<1) 150	<1(<1) 5	0
Zinc(total)	30	µg/L	2.5 (620-<2) 202	<2 (5.3-<2) 5	0
Miscellaneous					
Total Dissolved Solids	1,000	mg/L	748 (2,540-170) 384	692 (1,050-546) 5	20
Total Suspended Solids	the lesser of 10 mg/L or 10% over ambient	mg/L	15 (96-<1) 193	15 (57-15) 5	NDA
pH (range)	8.5-6.5	standard units	8.0 (9.2-6.9) 434	8.2 (8.5-7.3) 6	0
Dissolved Oxygen (conc.)	>5.0	mg/L	8.0 (19.4-0.0) 421	7.9 (13.0-0.6) 6	17
Aesthetics		visual	NDA	NDA	NDA
Oil and Grease		visual	NDA	NDA	NDA

*** based on a hardness of 300 mg/L
NDA: No Data Available

ANNUAL WATER QUALITY OBJECTIVES SUMMARY
SOURIS RIVER – NORTH DAKOTA/SASKATCHEWAN BOUNDARY 2010 (Jan 1- Dec 31)
STATION 05114000 SHERWOOD USGS

WATER QUALITY PARAMETER	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA Median (max-min)#samples	ANNUAL DATA Median (max-min)#samples	PERCENT EXCEEDANCE
Organic Parameters					
Atrazine	2	µg/L	<0.05(0.03-<0.001)12	NDA	NDA
Bromoxynil	5	µg/L	NDA	NDA	NDA
Carbaryl	90	µg/L	<0.003(<0.003)10	NDA	NDA
Chlordane	0.0043	µg/L	<0.10(0.10-<0.10)40	NDA	NDA
DDT	0.001	µg/L	<0.01(0.02-<0.01)40	NDA	NDA
Dieldrin	0.0019	µg/L	<0.01(0.03-<0.01)40	NDA	NDA
Dicamba	IN DEVELOPMENT	µg/L	<0.01(<0.01)3	NDA	NDA
Diclofop-methyl	IN DEVELOPMENT	µg/L	NDA	NDA	NDA
Heptachlor	0.0038	µg/L	<0.01(0.15-<0.01)40	NDA	NDA
MCPA	0.20	µg/L	NDA	NDA	NDA
Parathion	0.04	µg/L	<0.01(<0.01)40	NDA	NDA
Picloram	0.05	µg/L	<0.01(<0.01)3	NDA	NDA
Phenols(total)	1.0	µg/L	<16(26-<16)202	NDA	NDA
Polychlorinated biphenyl (total)	0.001	µg/L	<0.1(0.3-<0.1)39	NDA	NDA
Triallate	0.57	µg/L	<0.001(0.035-<0.001)10	NDA	NDA
Trifluralin	0.10	µg/L	<0.002(0.084-<0.002)10	NDA	NDA
2,4-D	4.0	µg/L	0.02(0.24-<0.01)26	NDA	NDA

NDA: No Data Available

ANNUAL WATER QUALITY OBJECTIVES SUMMARY

SOURIS RIVER – NORTH DAKOTA/MANITOBA BOUNDARY 2010 (Jan 1- Dec 31)
00US05NF0001 WESTHOPE

WATER QUALITY PARAMETER	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA* Median(max-min)#samples	ANNUAL DATA -2003 Median(max-min)#samples	PERCENT EXCEEDANCE
Biological Parameters					
Fecal Coliform	200/100 ml	#/100 ml	<10(2300-<2)406	6(200-<2)7	14
Inorganic Parameters					
Ammonia (un-ionized as NH3)	****	mg/L			
Chloride	100	mg/L	28(297-1.2)543	29(104-21.4)8	13
Fluoride	1.5	mg/L	0.21(0.98-<0.01)590	0.175(0.29-0.1)8	0
NO_2 + NO_3(as N)dissolved from 1990	1.0	mg/L	<0.01(1.11-<0.01)178	<0.01(0.044-<0.01)8	0
Phosphorus(total P) from 1990	0.10	mg/L	0.31(4.52-0.091)175	0.291(0.426-0.148)8	100
Sodium	100	mg/L	114(1040-6.4)788	132.5(434-70.1)8	63
Sulfate	450	mg/L	184(3490-4.8)788	273(794-151)8	13
Arsenic (total)	50	ug/L	4.1(33.4-0.5)355	4.645(6.79-2.6)8	0
Barium(total)	1000	ug/L	99(631-32.3)261	89.2(230-51.7)8	0
Boron(total)	500	ug/L	233.5(2080-<2)356	218(494-88.6)8	0
Beryllium(total)	100	ug/L	0.063(<0.5-0.004)145	0.0125(0.019-0.008)8	0
Cadmium(total)	***27	µg/L	0.2(5-0.006)297	0.015(0.077-0.006)8	0
Chromium(total)	50	µg/L	<1(2.36-<0.01)143	0.1(0.25-0.01)8	0
Cobalt(total)	50	ug/L	<1(9-0.172)264	0.2335(0.741-0.172)8	0

***based on hardness of 300 mg/L
****unionized ammonia is calculated using temperature and pH
NDA: No Data Available

ANNUAL WATER QUALITY OBJECTIVES SUMMARY

SOURIS RIVER – NORTH DAKOTA/MANITOBA BOUNDARY 2010 (Jan 1-Dec 31)
00US05NF0001 WESTHOPE

WATER QUALITY PARAMETER	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA Median(max-min)#samples	ANNUAL DATA Median(max-min)#samples	PERCENT EXCEEDANCE
Copper(total)	***30	µg/L	2(38-0.41)295	1.015(2.54-0.41)8	0
Iron(total)	300	ug/L	109(14500-<7)323	210.5(260-111)8	0
Lead(total)	***13	µg/L	1.3(6.7-0.079)293	0.184(0.259-0.07)8	0
Mercury	0.5 ug/g in fish flesh	µg/g		NDA	
Molybdenum(total)	10	ug/L	2.63(35.2-0.591)142	2.145(6-0.68)8	0
Nickel(total)	***220	µg/L	3.18(24.7-1.6)297	2.865(7.52-1.94)8	0
Selenium(total)	5	ug/L	0.365(2-<0.05)354	0.33(0.65-0.27)8	0
Zinc(total)	30	µg/L	2.505(32-0.36)290	0.9(5.67-0.4)8	0
Miscellaneous					
Total Dissolved Solids	1000	mg/L	749(3821.074-129)263	742.2165(2218-460.744)8	25
Total Suspended Solids	the lesser of 10 mg/L or 10% over ambient	mg/L	16(300-<1)574	7.4(10-2.8)8	13
pH (range)	8.5-6.5	standard units	8.3(9.85-6.8)460	8.225(8.5-7.89)8	13
Dissolved Oxygen (conc.)	>5.0	mg/L	8.4(21.6-0.05)457	9.6(18.1-4.1)8	13
Aesthetics		visual	NDA	NDA	NDA
Oil and Grease		visual	NDA	NDA	NDA

*** based on a hardness of 300 mg/L
NDA: No Data Available

ANNUAL WATER QUALITY OBJECTIVES SUMMARY

SOURIS RIVER – NORTH DAKOTA/MANITOBA BOUNDARY 2010 (Jan 1-Dec 31)
00US05NF0001 WESTHOPE

WATER QUALITY PARAMETER	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA Median(max-min)#samples	ANNUAL DATA Median(max-min)#samples	PERCENT EXCEEDANCE
Organic Parameters					
Atrazine	2	µg/L	<0.05(2.4-<0.00186)131	0.0143(0.0354-0.00186)3	0
Bromoxynil	5	µg/L	<0.0213(0.202-<0.00099)104	0.002385(0.00742-<0.00133)4	0
Carbaryl	90	µg/L			
a-Chlordane	0.0043	µg/L	<0.003(0.003-<0.00014)221	<0.0006(<0.0006-<0.0006)4	0
g-Chlordane	0.0043	ug/L	<0.002(<0.002-<0.00004)222	<0.00031(<0.00031-<0.00031)5	0
o,p-DDT	0.001	µg/L	<1(<4.0-<.00004)223	<0.00056(0.00056-<0.00056)4	0
Dieldrin	0.0019	µg/L	<0.002(<0.002-<0.00018)260	<0.00107(<0.00107-<0.00107)4	0
Dicamba	IN DEVELOPMENT	µg/L	<0.03(0.0451-<0.00073)141	0.00804(0.0125-0.0048)4	0
Diclofop-methyl	IN DEVELOPMENT	µg/L	<0.05(<0.05-<0.0034)116	<0.00735(<0.00735-<0.00735)3	0
Heptachlor	0.0038	µg/L	<0.001(0.004-<0.00014)258	<0.00056(<0.00056-<0.00056)4	0
MCPA	0.20	µg/L	0.09635(0.7-<0.00058)266	0.010915(0.111-0.00615)4	0
Parathion	0.04	µg/L	<0.0155(<0.088-<0.0155)25	NDA	0
Picloram	0.05	µg/L	<0.05(<0.2-<0.00033)205	0.0434(0.0607-<0.0414)4	25
Phenols(total)	1.0	µg/L			
Polychlorinated biphenyl (total)	0.001	µg/L	<0.0033(<0.0102-<0.00021)32	<0.00034(<0.00034-<0.00034)4	0
Triallate	0.57	µg/L	<0.01(0.072-0.0013)123	<0.00222(<0.00222-<0.00222)3	0
Trifluralin	0.10	µg/L	<0.005(0.01-<0.00266)127	<0.00266(<0.00266-<0.00266)3	0
2,4-D	4.0	µg/L	<0.03(0.587-<0.00047)270	0.0357(0.0995-0.0255)4	0

NDA: No Data Available

APPENDIX F

Water Quality Monitoring Plan for Sherwood and Westhope

1. Sherwood Monitoring Plan

Season	No. of Site Visits	No. of Samples Per Year			
		Dissolved Oxygen	Major Ions	Nutrients	Trace Elements
1(March through June)	3	3	3	3	3
2(July through October)	2	2	2	2	2
3(November through February)	2	2	2	2	2
TOTAL	7	7	7	7	7

2. Westhope Monitoring Plan

Season	No. of Site Visits	No. of Samples Per Year				
		Dissolved Oxygen	Major Ions	Nutrients	Trace Elements	Pesticides
1(March through June)	3	3	3	2	3	3
2(July through October)	3	3	2	3	2	1
3(November through February)	2	2	2	2	2	
TOTAL	8	8	7	7	7	4