



Infrastructure and Transportation

Water Management and Structures Division
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December 19, 2014

Terry Sargeant
Chair
Manitoba Clean Environment Commission
305 – 155 Carlton Street
Winnipeg, MB R3C 3H8

Dear Mr. Sargeant:

I am writing to you in response to a letter you sent to me on November 3, 2014 regarding the potential impacts of a new Lake Manitoba drainage channel to Lake Winnipeg. The questions outlined in your letter were as follows:

1. If and when a drainage channel is built from Lake Manitoba to Lake Winnipeg, how much water will be flowing from one lake to the next?
2. What will be the timing of this flowing (seasonal, intermittent or continuous)?
3. What is the expected impact on water levels in Lake Winnipeg?
4. What are the expected local and lake-wide environmental impacts?

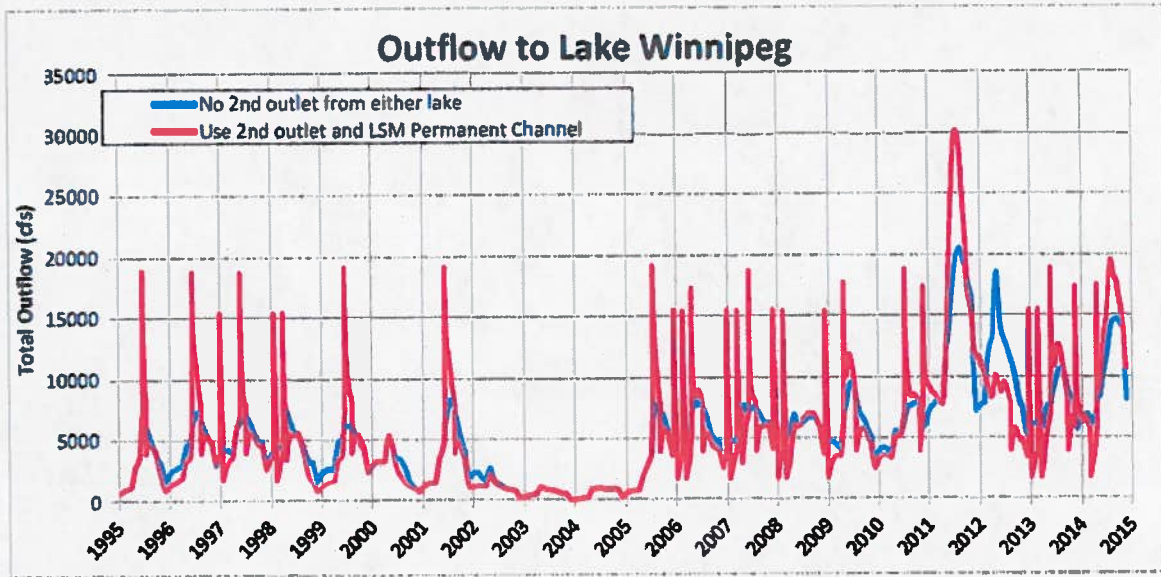
It should be noted from the outset that the proposed drainage works in question actually include both the construction of a new channel that will run from Lake Manitoba and Lake St. Martin and the upgrade and expansion of the existing Lake St. Martin outlet channel that was constructed after the 2011 flood. These projects are currently only in the conceptual design phase so certain assumptions had to be made about the operation and configuration of these channels based on the best information available. The information and analysis provided in this letter could be subject to change as the projects advance to further stages.

In response to your first question about channel flow rates, the flow capacity of each channel will vary with the lake levels. The Lake Manitoba outlet channel will have a capacity of 0 cubic feet per second (cfs) when the water level on Lake Manitoba is 810 ft and a capacity of 7,500 (cfs) when the water elevation on Lake Manitoba is 814 ft. The Lake St. Martin outlet channel will have a capacity of 0 cfs when the water elevation on Lake St. Martin is 797 ft and a capacity of 11,500 cfs when the water elevation on Lake St. Martin is 801 ft. The drainage channels will of course not change the total volume of water flowing to Lake Winnipeg but rather the timing of the flows, which relates to your second question.

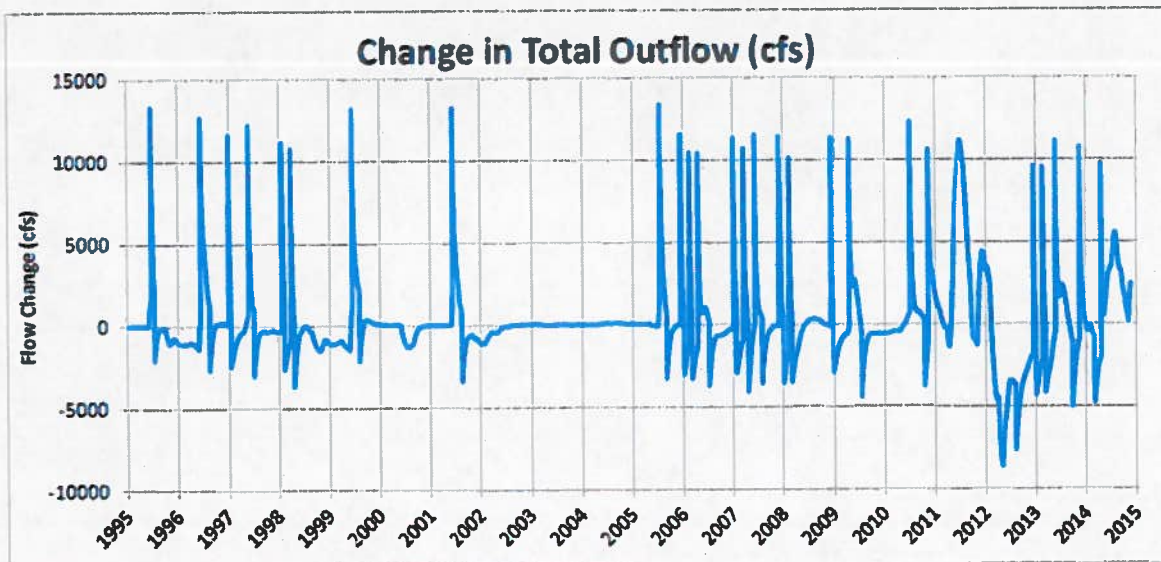
The channels would be opened whenever the lakes exceed their desirable lake levels. Assuming that the operating regime for the Lake Manitoba outlet channel is similar to that of the

Fairford River Water Control Structure, the outlet channel would be put into operation when average lake levels exceed 812 ft and would remain open until the lake level recedes to 811 ft. It was assumed that the Lake St. Martin outlet channel would be opened when the lake level exceeds 801 ft and would remain open until the lake level recedes to 799 ft.

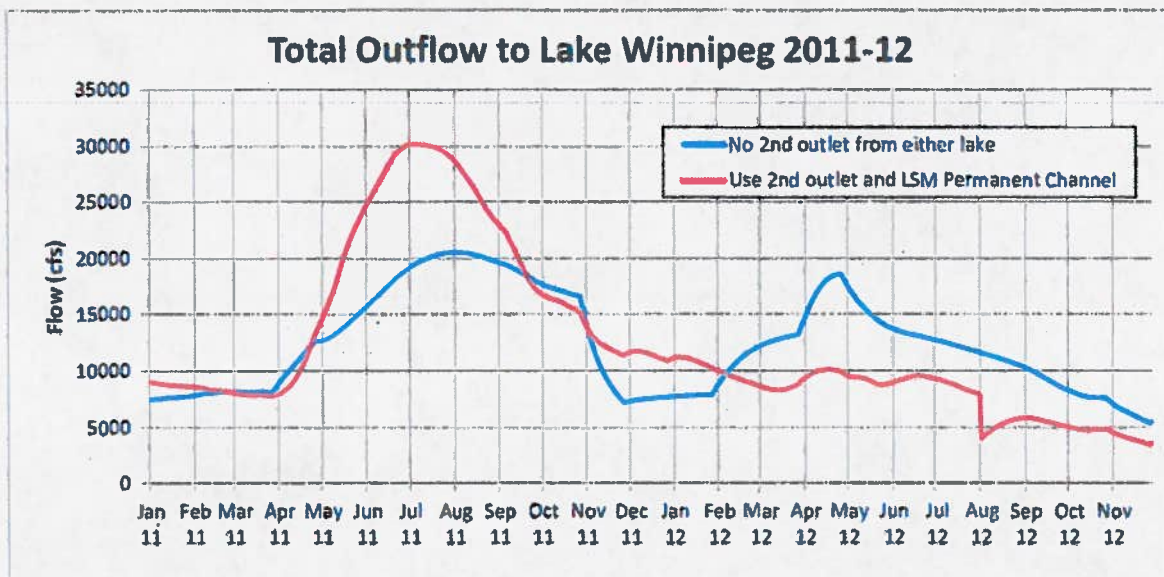
The following figure shows the computed outflows to Lake Winnipeg over the past 20 years without the proposed works (blue line) compared to simulated outflows with the proposed works (red line).



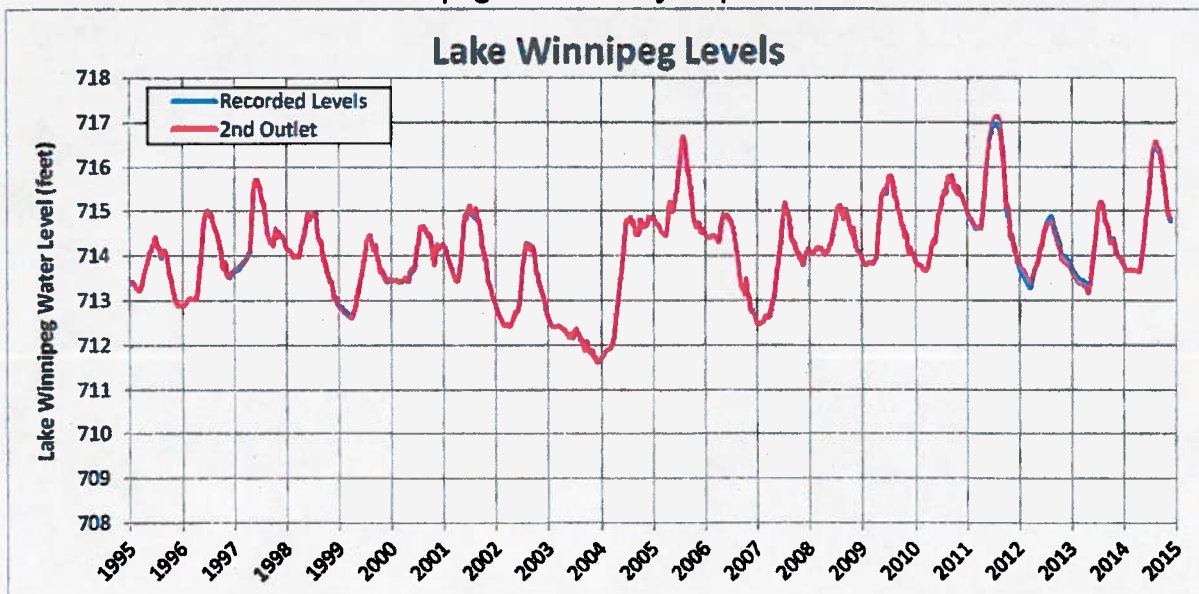
Plotting the difference between the computed outflows with and without the additional channels demonstrates that the flows would increase rapidly when the proposed channels are opened, but the duration of the increase in flow would be relatively short (see figure below). This chart also shows that each flow increase is followed by a flow decrease. This reflects the fact that the proposed outflow channels change the timing of the flows, not the total volumes. It should also be noted that the rapid flow increases do not necessarily correspond to a given season.



Focusing on the 2011 flood, which was the largest recorded flood on Lake Manitoba, it can be seen in the following chart that the proposed outlet channels would result in increased flows to Lake Winnipeg through much of 2011, but generally lower flows in 2012.



Extending this analysis further we can demonstrate the impact that the proposed outlet channels would have had on Lake Winnipeg water levels. The following chart shows recorded and simulated levels on Lake Winnipeg over the 20 year period from 1995 to 2014.

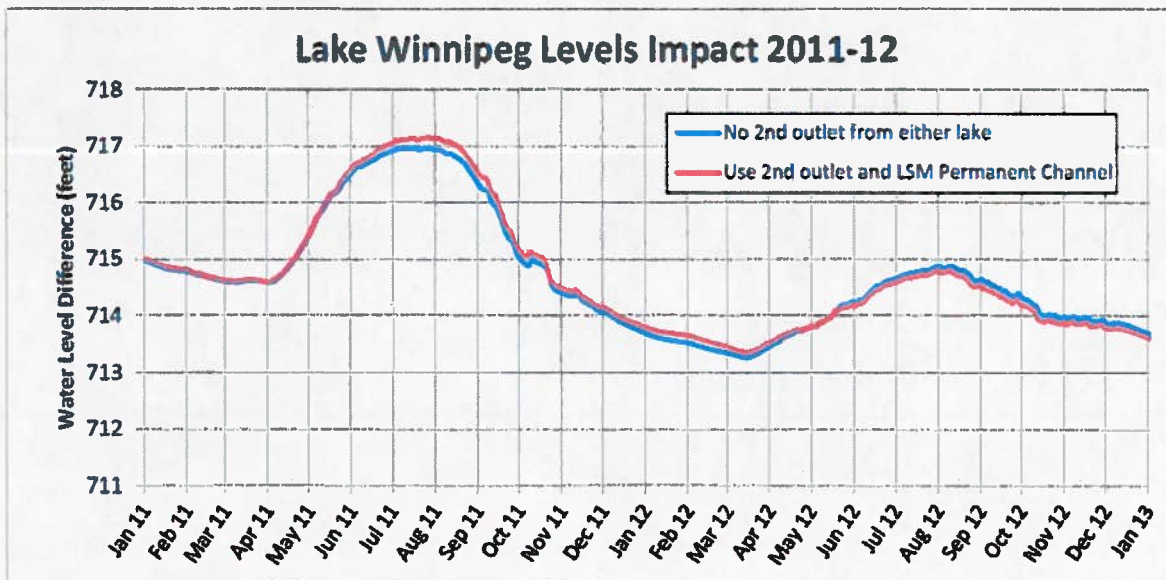


As can be seen, there is very little difference in lake levels. The reason for this is that the proportion of Lake Manitoba inflows compared to total inflows to Lake Winnipeg is relatively small. For example, during the 2011 flood, the flow into Lake Winnipeg with the proposed outlet channels would be 8,000 to 10,000 cfs higher for three months. During this period the total inflows to Lake Winnipeg were around 180,000 cfs, so the incremental flow increase due to the proposed channels during the time of greatest impact (largest flood of record for Lake Manitoba) would be about 5% of the total inflow to Lake Winnipeg.

The annual peak Lake Winnipeg levels with and without the proposed channels are compared in the following table. As can be seen the operation of the two proposed channels during the 2011 flood would have raised the Lake Winnipeg peak level by 0.18 ft. In all other years the impact would have been less than 0.05 ft.

Year	Recorded Maximum Level (ft.)	Maximum with Channels	Diff (ft)	Year	Recorded Maximum Level (ft.)	Maximum with Channels	Diff (ft)
1995	714.39	714.43	0.04	2005	716.65	716.69	0.04
1996	715.01	715.01	0.00	2006	714.94	714.95	0.01
1997	715.69	715.72	0.03	2007	715.17	715.19	0.02
1998	714.99	714.98	-0.01	2008	715.14	715.13	-0.01
1999	714.46	714.47	0.01	2009	715.76	715.79	0.04
2000	714.67	714.66	0.00	2010	715.78	715.81	0.03
2001	715.09	715.13	0.04	2011	716.97	717.15	0.18
2002	714.29	714.27	-0.02	2012	714.89	714.80	-0.08
2003	712.56	712.56	0.00	2013	715.22	715.20	-0.02
2004	714.88	714.88	0.00	2014	716.65	716.69	0.04

The chart below shows Lake Winnipeg levels for 2011 and 2012. With the proposed channels the levels would have been slightly higher in 2011 and slightly lower in 2012. This is because the additional outlets from Lake Manitoba and Lake St. Martin impact on the timing of the flows to Lake Winnipeg.



It should be noted that assumptions had to be made in the above analysis about the operation of the Lake Winnipeg outlet by Manitoba Hydro when the water level on Lake Winnipeg was

below 715 ft. Under the terms of Manitoba Hydro's interim operating license for Lake Winnipeg the outlet must be fully opened whenever the lake level exceeds 715 ft and regulation of the lake level is at the discretion of Manitoba Hydro when the lake level is below 715 ft. Therefore the simulated levels on Lake Winnipeg with the two emergency channels in place should be accurate for periods when the structure is fully opened, but less precise when lake levels are below 715 ft since operation within that range depends on Manitoba Hydro's water management requirements.

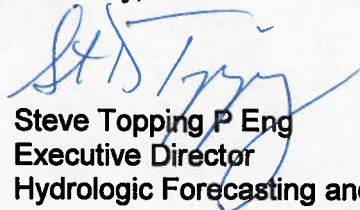
In response to your last question on environmental impacts, MIT is in the early stages of this project and has not yet initiated an environmental assessment. Therefore it is too early to provide comment on expected local and lake-wide environmental effects. MIT has undertaken an environmental monitoring program of the existing Lake St. Martin Emergency Outlet Channel since 2011. This monitoring program is ongoing and we are expecting analysis and characterization of the environmental impacts by May of 2015.

In summary:

- The flow capacity of the two proposed outlet channels will vary based on lake levels. The Lake Manitoba outlet channel will have a capacity of 0 cubic feet per second (cfs) when the water level on Lake Manitoba is 810 ft and a capacity of 7,500 (cfs) when the water elevation on Lake Manitoba is 814 ft. The Lake St. Martin outlet channel will have a capacity of 0 cfs when the water elevation on Lake St. Martin is 797 ft and a capacity of 11,500 cfs when the water elevation on Lake St. Martin is 801 ft.
- The timing of the inflow increases to Lake Winnipeg due to the proposed channels will be intermittent.
- The expected impacts on water levels in Lake Winnipeg due to the proposed channels are expected to be minimal. A simulation of the 2011 flood (largest flood on record for Lake Manitoba) with the proposed channels in place yielded an increase in the peak water level of 0.18 ft on Lake Winnipeg.
- An environmental assessment of this project has not yet been initiated. The results of an environmental monitoring program established in 2011 for the Lake St. Martin Emergency Outlet Channel should be available by May 2015

Should you require any further clarification on the information provided please feel free to contact me.

Sincerely,



Steve Topping P Eng
Executive Director
Hydrologic Forecasting and Water Management