

**Manitoba Hydro Undertaking #31**

**Manitoba Hydro to file graphs from 2006 and 2007 from the Winnipeg River at Seven Sisters, the Red River at Lockport, and the Saskatchewan River at The Pas. Manitoba Hydro to also file graphs from Lake of the Woods and indicate its water levels and inflows.**

This undertaking relates to the discussions on 2006/07 operations of reservoirs supplying Manitoba Hydro and resulting summer off-peak export activity and subsequent winter import activity. Numerous IRs have been answered relating to these operations, including:

PUB/MH/RISK-80(c)  
PUB/MH/RISK-81(b)  
PUB/MH/RISK-81(c)  
PUB/MH/RISK-124(a)  
PUB/MH II-217(c)

In addition to the requested water level and hydrographs listed in this undertaking, charts are provided for Lake Winnipeg, Southern Indian Lake and Kettle Generating Station to aid in the explanation of reservoir operations during FY2006/07. An explanation of the charts and key operating conditions is provided below.

***Figure 1(a), 1(b), 1(c) – Lake of the Woods***

Lake of the Woods levels and outflows are controlled by the Lake of the Woods Control Board. Lake of the Woods outflows were transitioned from the second highest on record since 1977 to near median from April 2006 through June 2006 (Fig. 1(c)). The lake was drawn to below lower quartile levels by the end of June 2006 (Fig. 1(a)). High spring and early summer outflows from Lake of the Woods added pressure to the rising level of Lake Winnipeg. Lake of the Woods outflows were subsequently reduced to post-1976 record low levels by winter 2006/07, limiting supply to Manitoba Hydro generation on the Winnipeg River. These operations resulted in Lake of the Woods elevation being approximately 0.5 feet below median by Spring 2007 (Fig. 1(a)).

***Figure 2 – Flow at Seven Sisters***

Flows reduced from the 4<sup>th</sup> highest post-1976 April flow to record lows by fall 2006. Manitoba Hydro experienced the lowest flows in the past 43 years on the Winnipeg River from November, 2006 to mid-February, 2007.

### ***Figure 3 – Red River***

The flow in the Red River is not regulated. During the spring of 2006 the Red River flow peaked at almost 90,000 cubic-feet-per-second (cfs), ranking among the top 5 spring runoff events since 1976. The volume of water from the Red River during April amounted to approximately 50% of the inflow to Lake Winnipeg.

### ***Figure 4 – Cedar Lake***

To the extent possible, discharge at Grand Rapids was reduced during spring 2006 to lessen pressure on Lake Winnipeg. Generation was maximized during the high load periods of the winter and the reservoir was drawn to near minimum by spring 2007. This operation reduced the need for winter imports.

Note that total inflow to Cedar Lake is plotted (to include local inflows) as opposed to Saskatchewan River flow at The Pas, which was requested in this undertaking.

### ***Figure 5 – Lake Winnipeg***

In anticipation of above average spring runoff, Manitoba Hydro maintained maximum outflow from Lake Winnipeg through the spring. Lake Winnipeg levels increased to near 715 feet, the upper licence limit for power operations, by early May 2006. Manitoba Hydro continued maximum discharge operation until mid-June when the threat of exceeding 715 feet had passed. At that point, a rapid flow reduction was implemented resulting in total outflows dropping from a peak of approximately 140,000 cfs in mid-June to 88,000 cfs for the remainder of June, and then stabilizing at approximately 110,000 cfs in early July. Steady outflow reductions were implemented through the summer and total outflows were reduced to below 40,000 cfs by October. By the first week of December, outflows were increased to the maximum attainable under ice restrictions in order to maximize supply to the Lower Nelson River for winter generation and minimize the need for winter imports.

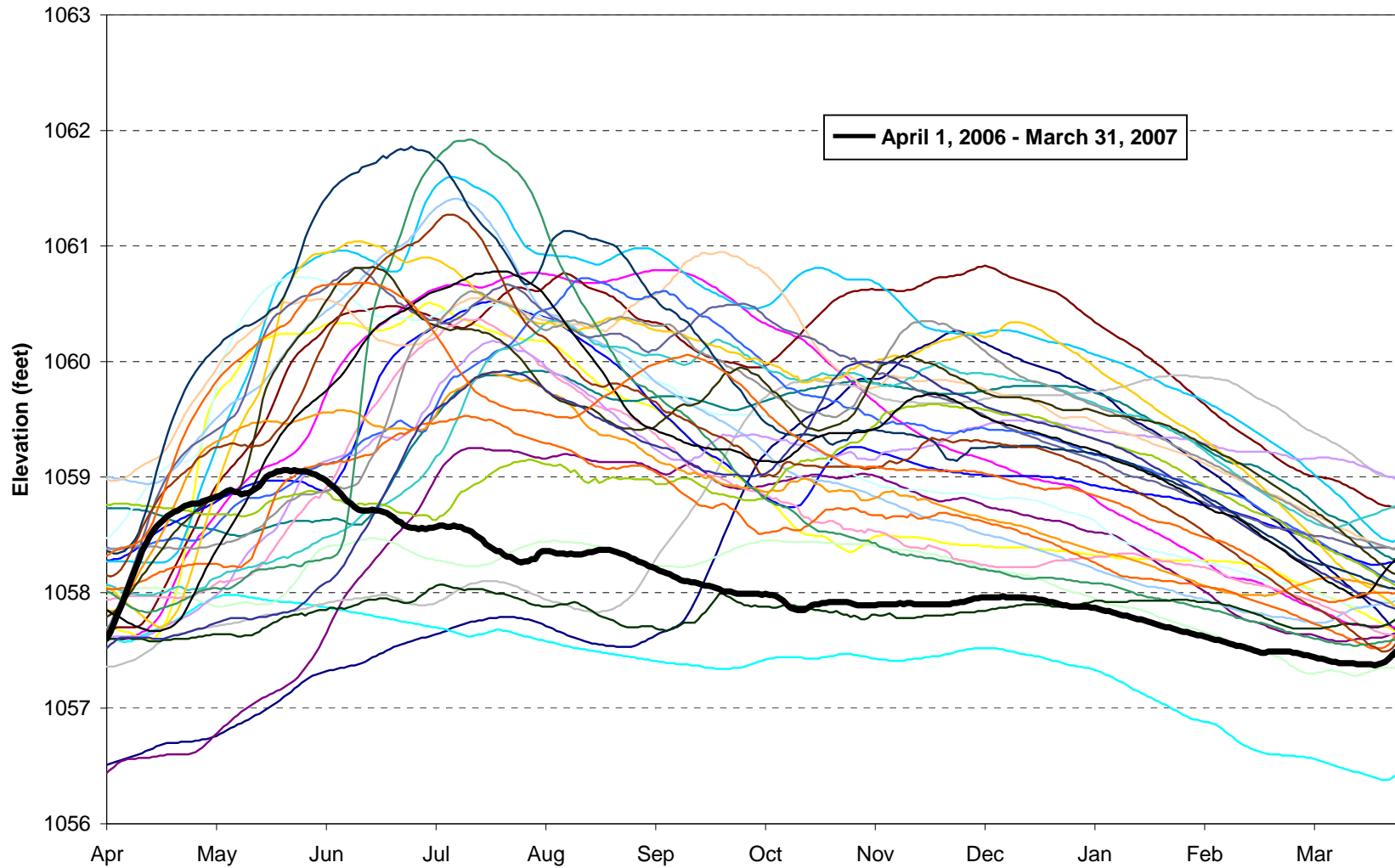
### ***Figure 6 – Southern Indian Lake and CRD Operations***

Southern Indian Lake outflows at Notigi were maximized when the water could be used for generation on the Lower Nelson River. Diversion flows were operated below maximum when the Lower Nelson River was spilling; increasing diversion flows under these conditions would exacerbate flooding on Split Lake. In addition to these operations, Missi flows were increased in order to maintain Southern Indian Lake levels below its upper licence limit of 847.5 feet. Churchill River diversion flows were maximized through the 2006/07 winter period to the extent allowable by the Churchill River Diversion Licence and Augmented Flow Program. This operation maximized supply to the Lower Nelson River for winter generation (and minimized the need for winter imports).

***Figure 7 – Lower Nelson River Operations – Kettle Discharge / Stephens Lake***

Nelson River inflows were high for the period of April through to mid-August due to flood flows from Lake Winnipeg. Manitoba Hydro maximized export activity (including off-peak sales) to the extent possible in order to maximize net revenues. High off-peak sales activity ceased in early September after the effect of successive Lake Winnipeg outflow reductions reached the Lower Nelson River. Stephens Lake was drawn down to below normal levels in early February, 2007 to maximize generation during a period of extreme cold weather and high load.

Figure 1(a). Lake of the Woods Smoothed Elevation - 1977-2010



**Figure 1(b). Lake of the Woods Inflow - 1977-2010**

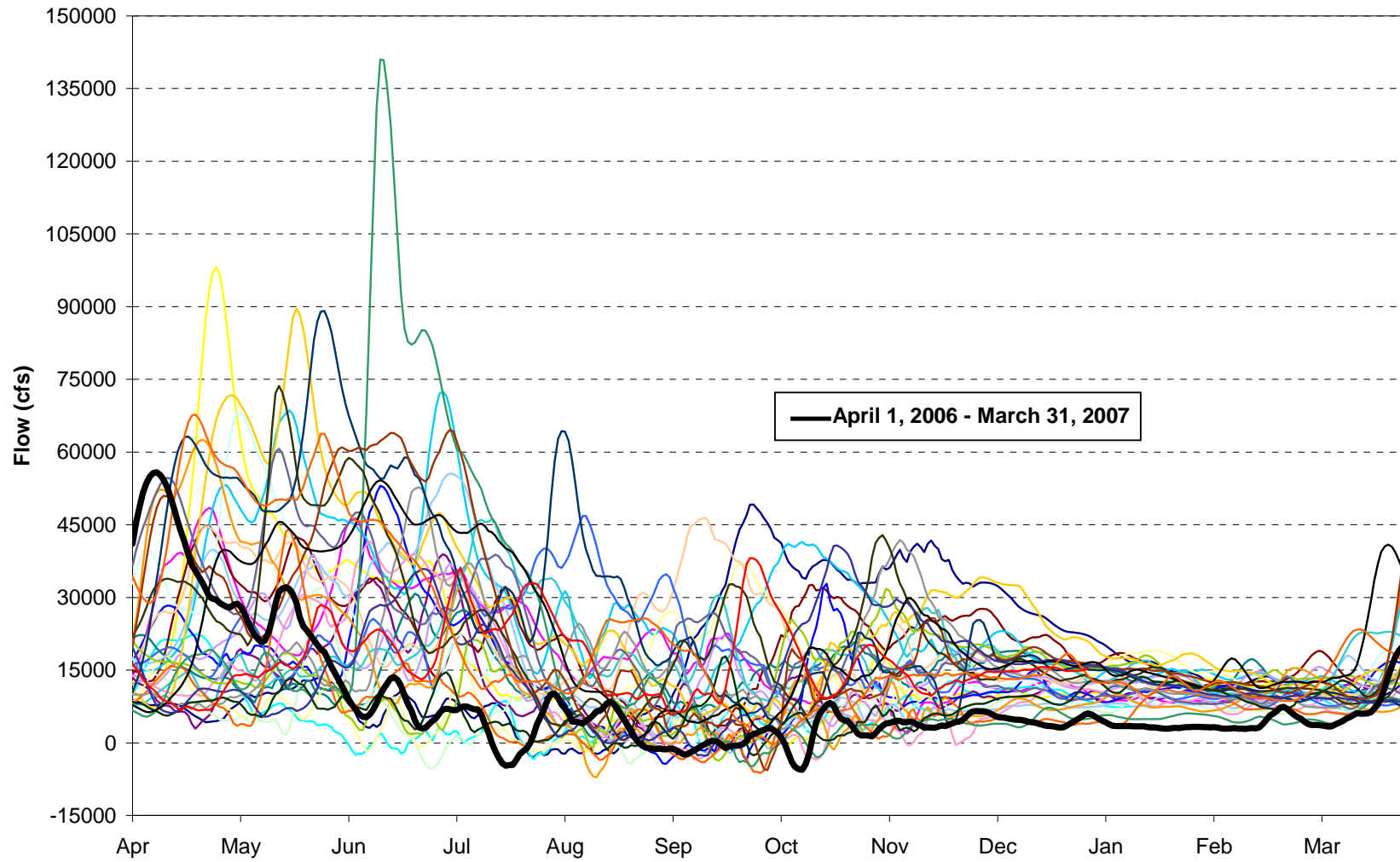
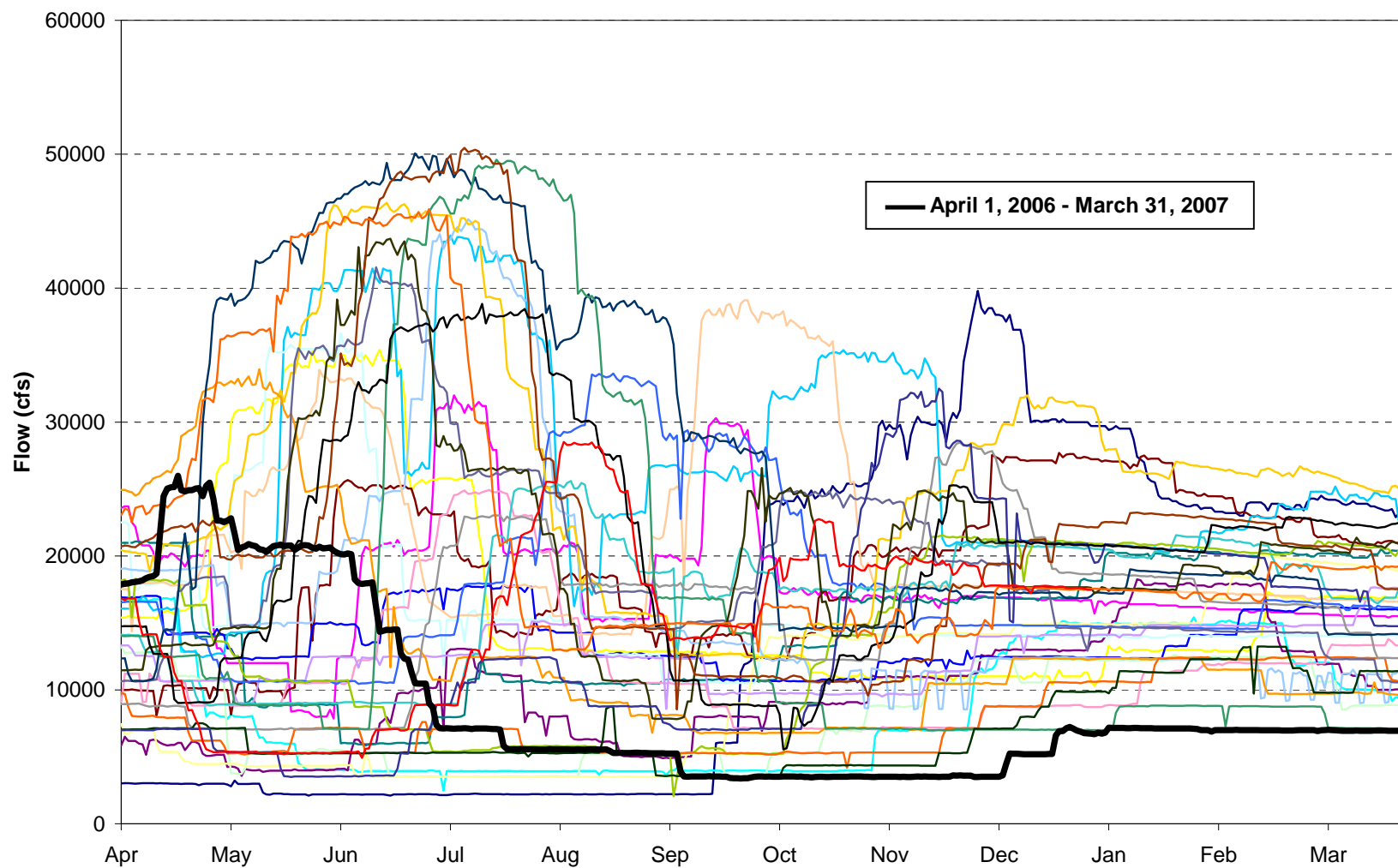
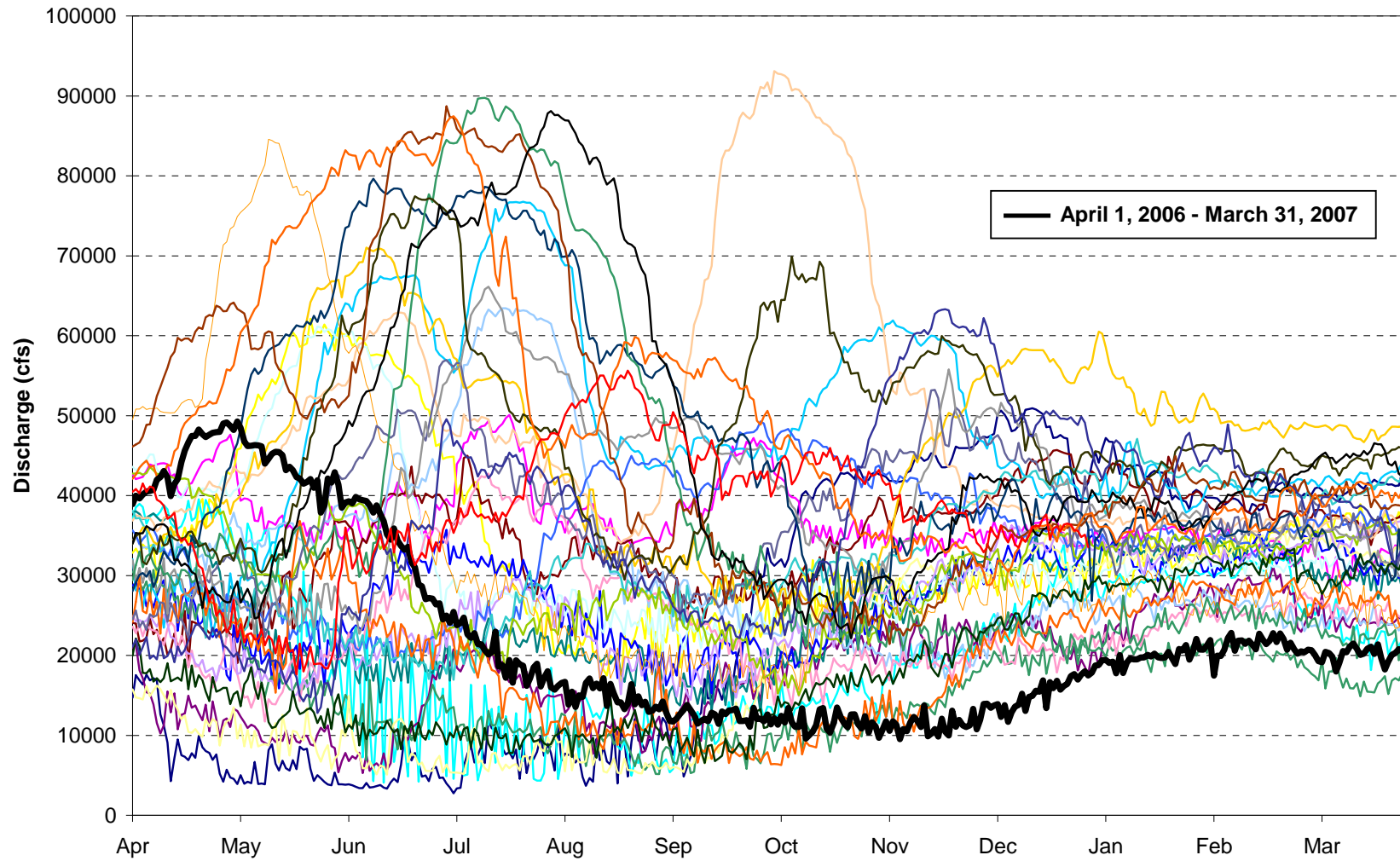


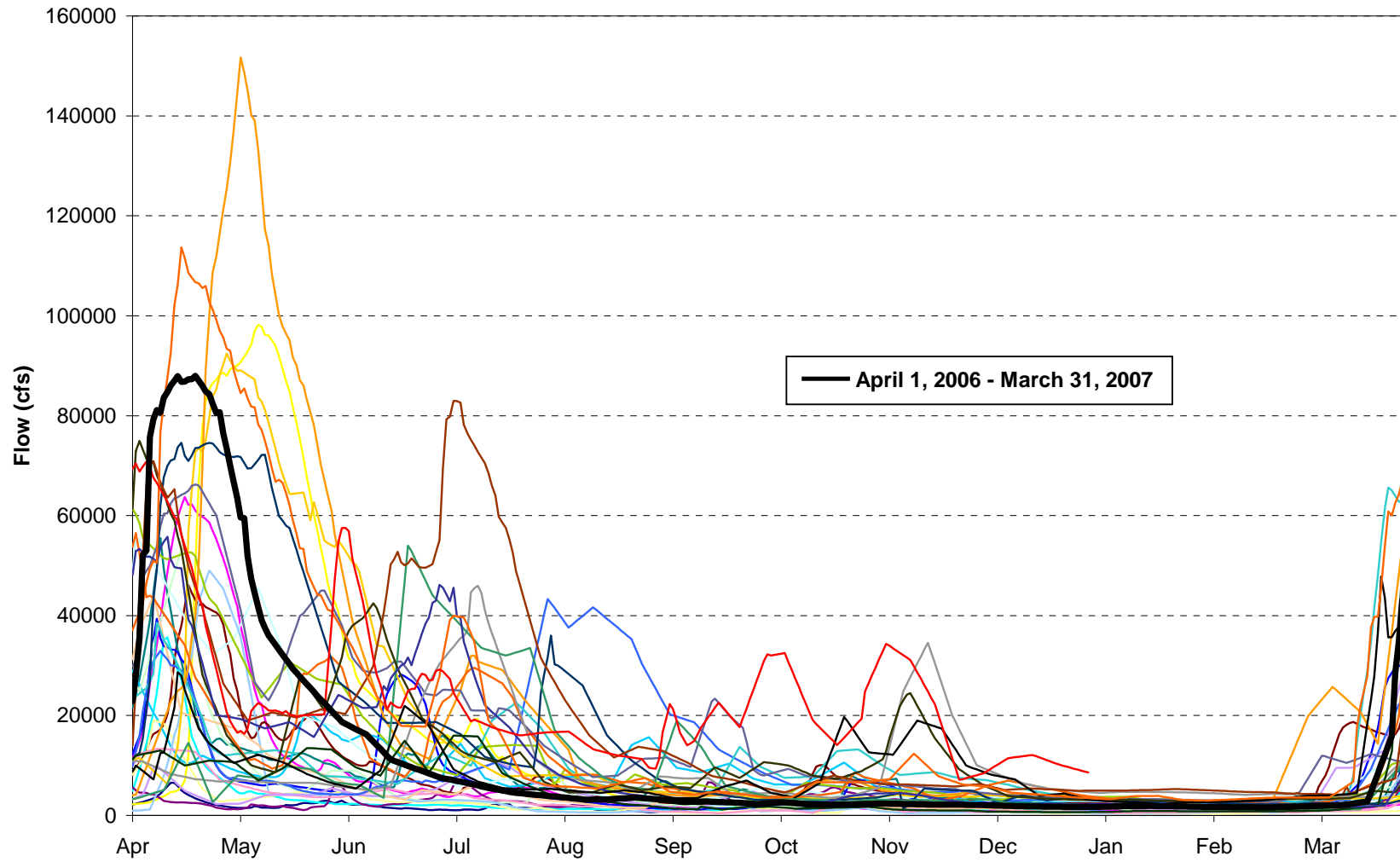
Figure 1(c). Lake of the Woods Outflow - 1977-2010



**Figure 2. Seven Sisters Generating Station Discharge - 1977-2010**



**Figure 3. Red River Flow - 1977-2010**





### Figure 4. Cedar Lake Elevation and Flows

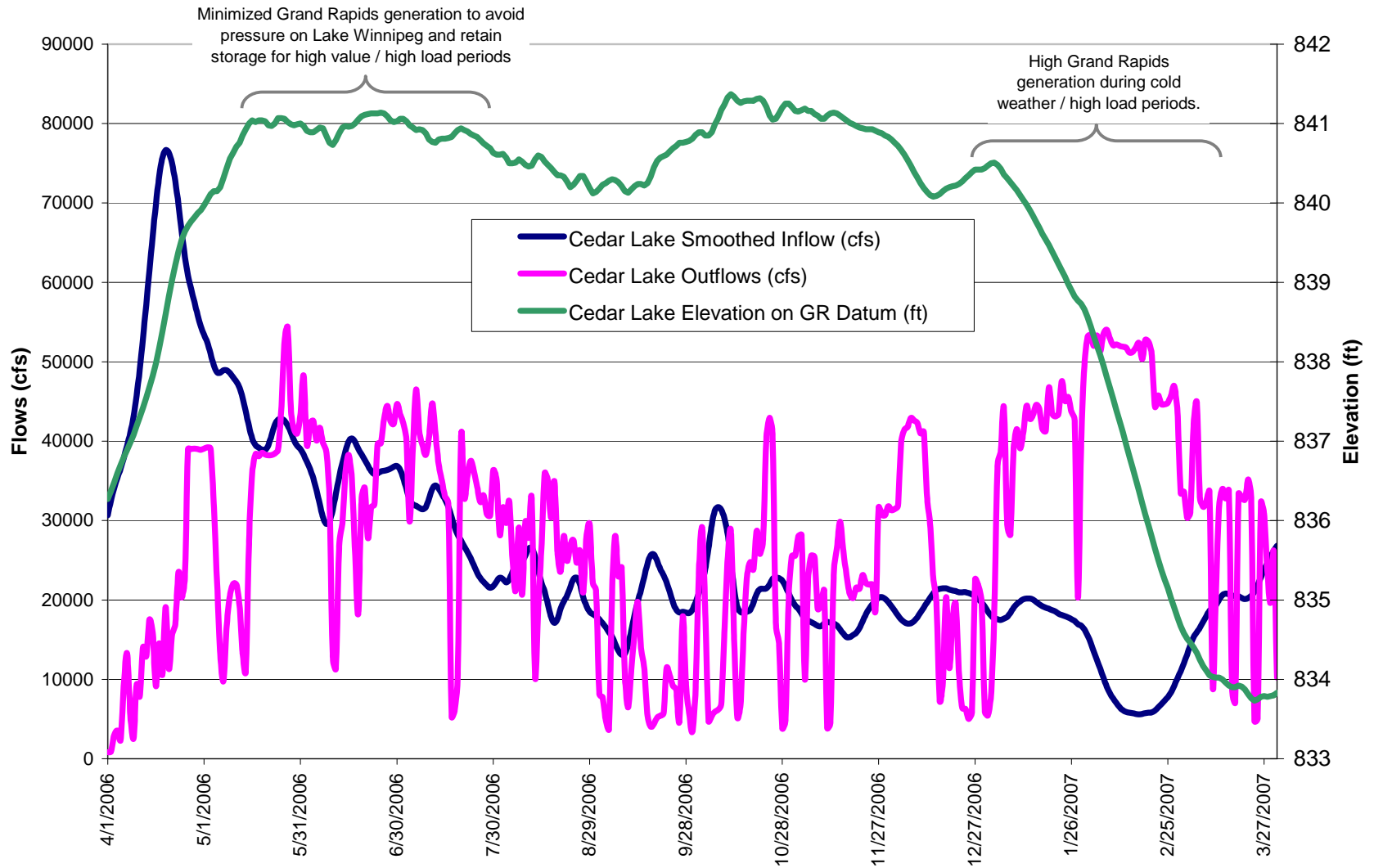
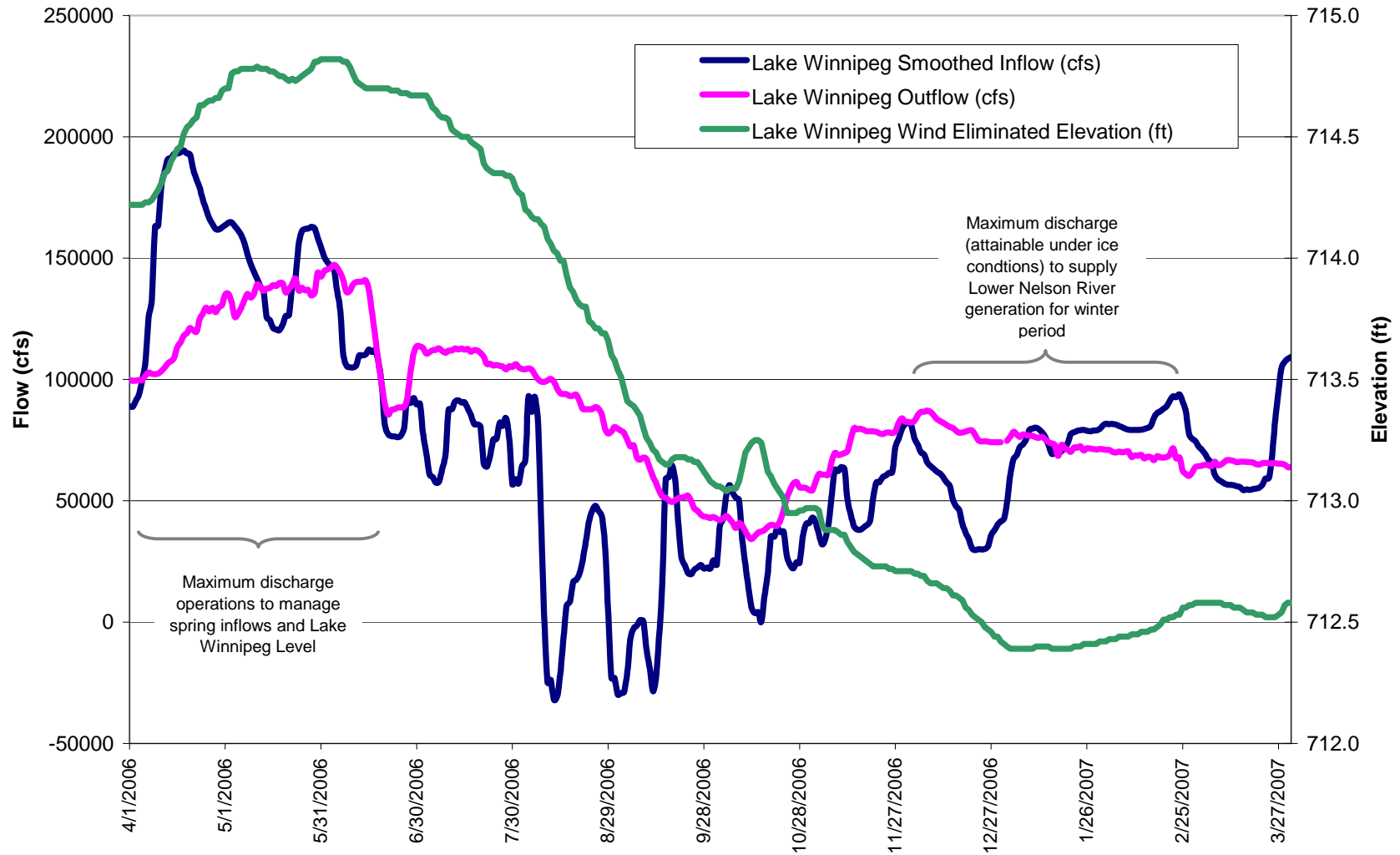
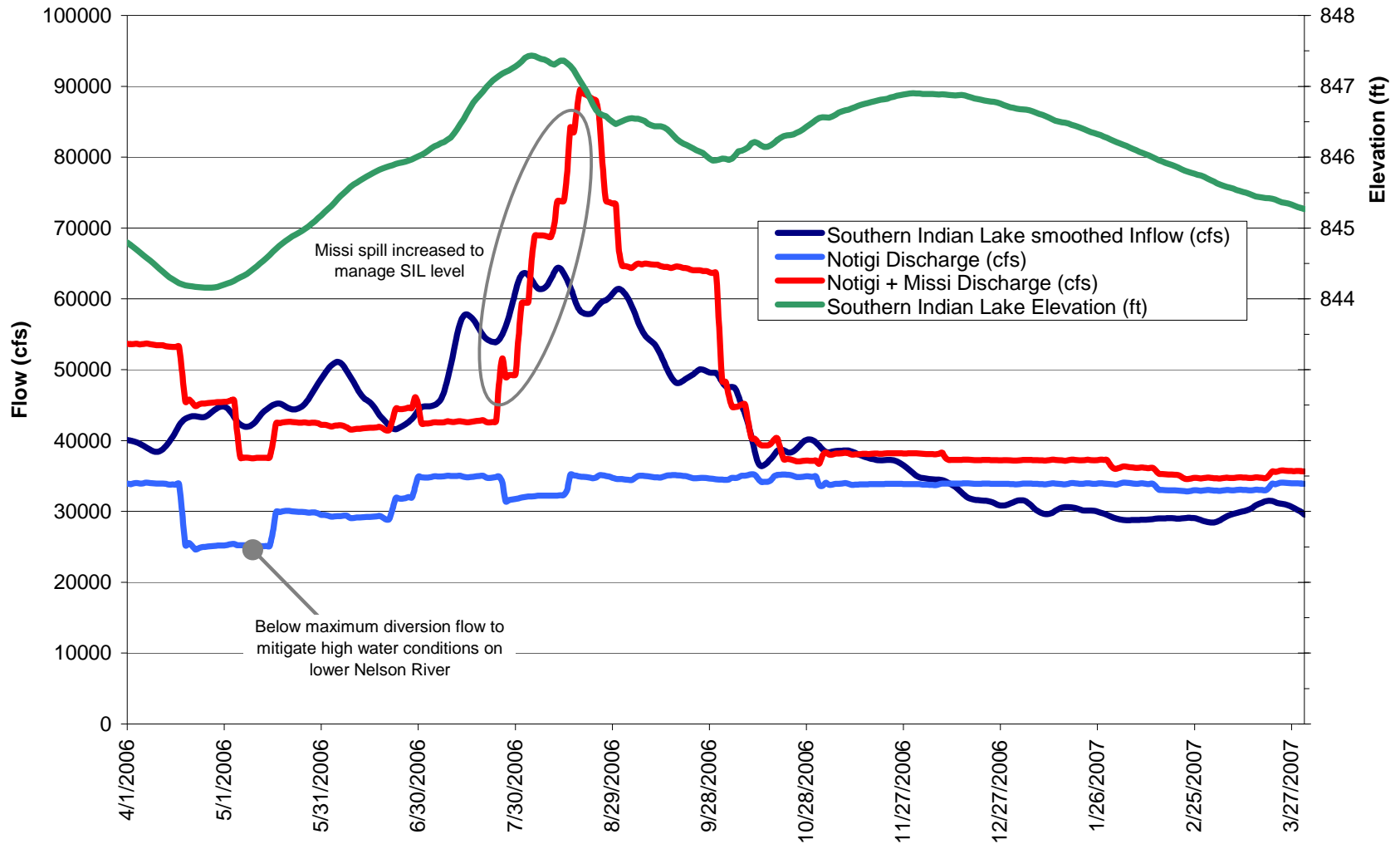


Figure 5. Lake Winnipeg



**Figure 6. Southern Indian Lake and CRD Operations**



### Figure 7. Lower Nelson River Operations - Kettle Discharge / Stephens Lake

