

# LAKE MANITOBA AND LAKE ST. MARTIN OUTLET CHANNELS CONCEPTUAL DESIGN

## Preliminary Options





# WELCOME!

The Province is committed to enhancing Lake Manitoba and Lake St. Martin outlet capacities to better regulate water levels on these lakes. The purpose of this open house is to solicit public opinion on the conceptual design options.

This initiative will help the Province better understand the flood risks and the possible options that can be used to reduce the effects from future flood events. The objective is to evaluate options for an enhanced Lake Manitoba and Lake St. Martin outlet capacity.

Manitoba Infrastructure and Transportation is also evaluating the Assiniboine River and Lake Manitoba watersheds and how we can provide greater protection from flooding risks. Additional public consultations for the Assiniboine River and Lake Manitoba Basins Flood Mitigation Study are planned for this fall.



Fairford River Water Control Structure at PTH 6  
(December 2011)



Fairford River Downstream of  
Fairford Water Control Structure (July 2011)



PTH 6 and the Fairford River Water Control Structure  
(December 2011)

## WE VALUE YOUR FEEDBACK!

Information is being shared today on each of the conceptual options.

- Ask us any questions you have about this initiative.
- Share your thoughts on the presented options.
  - Fill out a comment form.



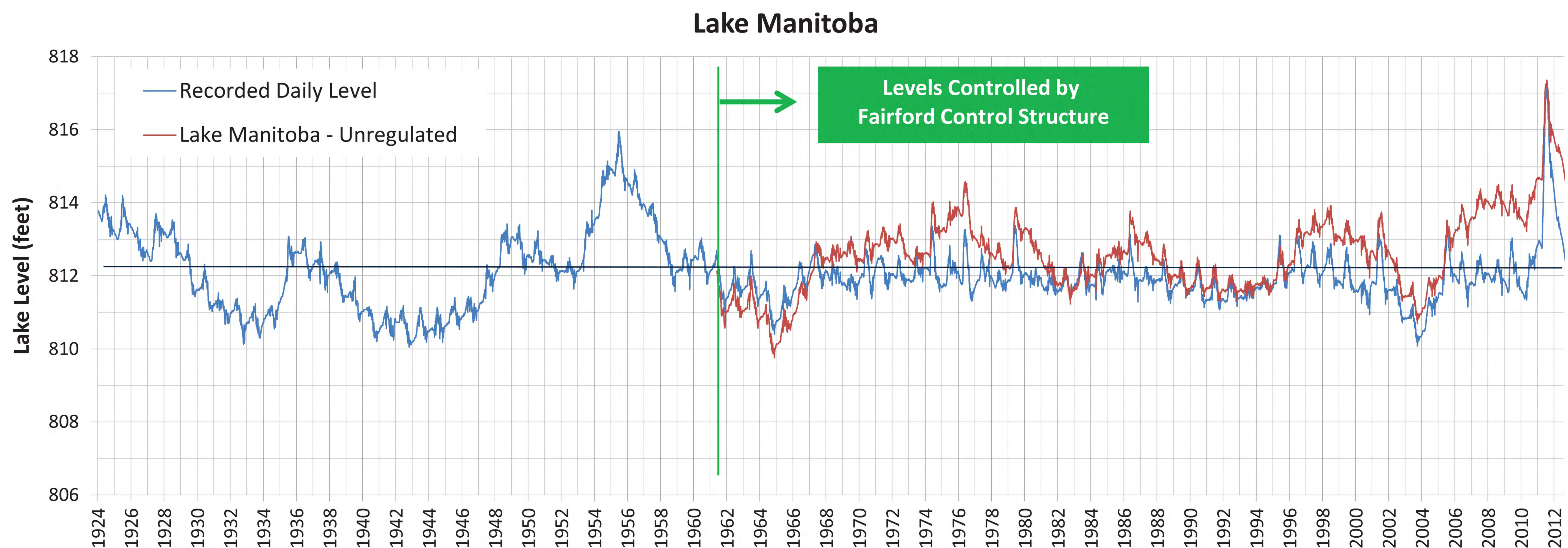




# BACKGROUND / HISTORY

## Lake Manitoba Regulation

- In the first half of the 20<sup>th</sup> century Lake Manitoba experienced significant fluctuations in water levels.
- Lake Manitoba was above flood stage for approximately 3 years in the 1950's.
- The Fairford River Water Control Structure was put into operation in 1961 to better regulate water levels and was the Province's first major flood control infrastructure.
- The design of this structure considered the total inflow to Lake Manitoba including the Portage Diversion, which was completed later in 1970.
- Today, approximately 3000 homes and cottages surround Lake Manitoba.



Lake Manitoba Recorded and Unregulated Levels (source: 2011 Lake Manitoba & Lake St. Martin Regulation Review Report)



# BACKGROUND / HISTORY

## (Continued)

### Lake St. Martin

- Additional outlet capacity for Lake St. Martin was not part of the original Fairford River Water Control Structure Project.
- Options to alter the water level regimes on Lake St. Martin, including additional Lake St. Martin outlet capacity, were previously studied by the Manitoba Water Commission in 1978 but were not recommended.

### Portage Diversion

- The Portage Diversion was completed and put into service in 1970.
- The Portage Diversion provides significant water level benefits to:
  - City of Winnipeg.
  - City of Portage la Prairie.
  - Downstream communities on the Assiniboine and La Salle Rivers.
- The benefits for each of the areas vary depending on the size and extent of each flood.

The current system has worked to maintain Lake Manitoba water levels below flood stage between 1961 and 2011.



# OTHER FLOOD MITIGATION INITIATIVES

- **Assiniboine River and Lake Manitoba Basins Flood Mitigation Study.**
- **Review of operating guidelines for key provincial flood control infrastructure:**
  - Red River Floodway.
  - Portage Diversion.
  - Fairford River Water Control Structure.
- **Significant investments in flood mitigation:**
  - Individual flood protection province-wide including Lake Manitoba.
  - Upgrades to the Provincial Assiniboine River dikes and reviewing options to increase flows downstream of Portage la Prairie.
  - Community flood protection province wide including Brandon.
  - Upgrades and rehabilitation to existing flood control infrastructure.
- **Evaluation of many additional flood mitigation demands.**



# LAKE MANITOBA & LAKE ST. MARTIN FLOOD MITIGATION STRATEGY

The overall strategy for Lake Manitoba and Lake St. Martin flood mitigation includes multiple components that are intended to work together:

- Additional Lake Manitoba and Lake St. Martin outlet capacity.
- Individual home, cottage and business & community flood protection at 2011 flood protection levels (FPL's) 6 to 8 feet above the 814.0 feet flood stage.
- Enhancing Assiniboine River Dikes to increase reliable flows east of Portage la Prairie.
- Shellmouth Dam enhancements.
- Land use planning initiatives.



Home / Cottage Raised to FPL



Lake St. Martin Channel – (October 2013)



# NEED FOR ADDITIONAL OUTLET CAPACITY

## Lake Manitoba & Lake St. Martin:

- Record flooding in 2011 and 2014 resulted in unprecedented inflows.
- Both lakes peaked well above flood stage.
- Evacuations were required and significant damage occurred to hundreds of properties.
- An emergency outlet channel was constructed at Lake St. Martin in 2011 to lower both lakes. The channel was closed in November 2012 as required by the Federal regulatory authorization.
- Heavy rains in 2014 resulted in Lake Manitoba and Lake St. Martin levels peaking above flood stage.
- The emergency outlet channel was re-opened in July 2014.

## Post 2011 Flood Review:

- After the 2011 flood, the Manitoba Government commissioned the Lake Manitoba & Lake St. Martin Regulation Review Committee and also the 2011 Flood Review Task Force.
- The Committee and the Task Force both made specific recommendations for permanent additional outlet capacity from Lake Manitoba and Lake St. Martin to improve the control of water levels on both lakes. The Province accepted this recommendation.





# OBJECTIVES

## The objectives of the conceptual design include:

- Identify outlet channel options to increase outflow capacity for Lake Manitoba and Lake St. Martin;
- Develop conceptual designs and cost estimates for these options;
- Determine the benefit of an outlet channel to reduce water levels on both lakes for a range of outflow capacities;
- Perform a preliminary review of potential environmental concerns;
- Recommend which outlet options should be pursued; and
- Share information with the public and seek input.



Main Market Road Bridge downstream of the Fairford River Water Control Structure - (July 2011)



# PRELIMINARY OPTIONS

## Lake Manitoba Outlet Channel



### Option A – Twinning the Fairford River

- Twinning of the existing Fairford River from Lake Manitoba to Lake St. Martin; crosses through the Fairford River at two locations.
- Situated primarily on Pinaymootang First Nation Land.
- New upstream and downstream control structure and bridge; new municipal bridges.
- 12.5 km channel; considered for a range of flows.



### Option B – Channel south of Pinaymootang First Nation

- A new channel connecting Portage Bay on Lake Manitoba with Lake St. Martin.
- Situated on privately held land and crown leased land.
- New control structure and bridge; new municipal bridges.
- Requires rock excavation.
- 11.5 km channel; considered for a range of flows.



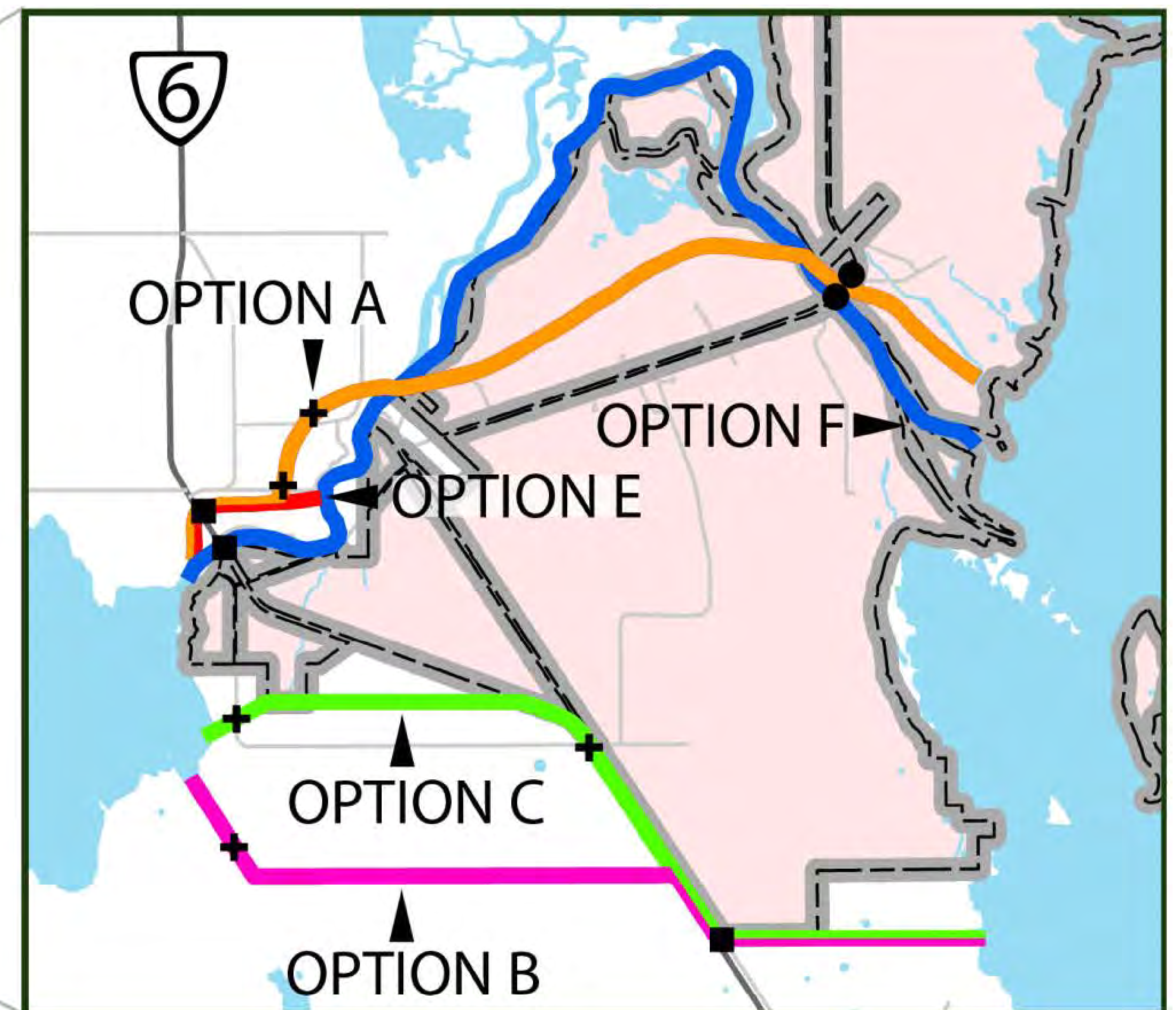
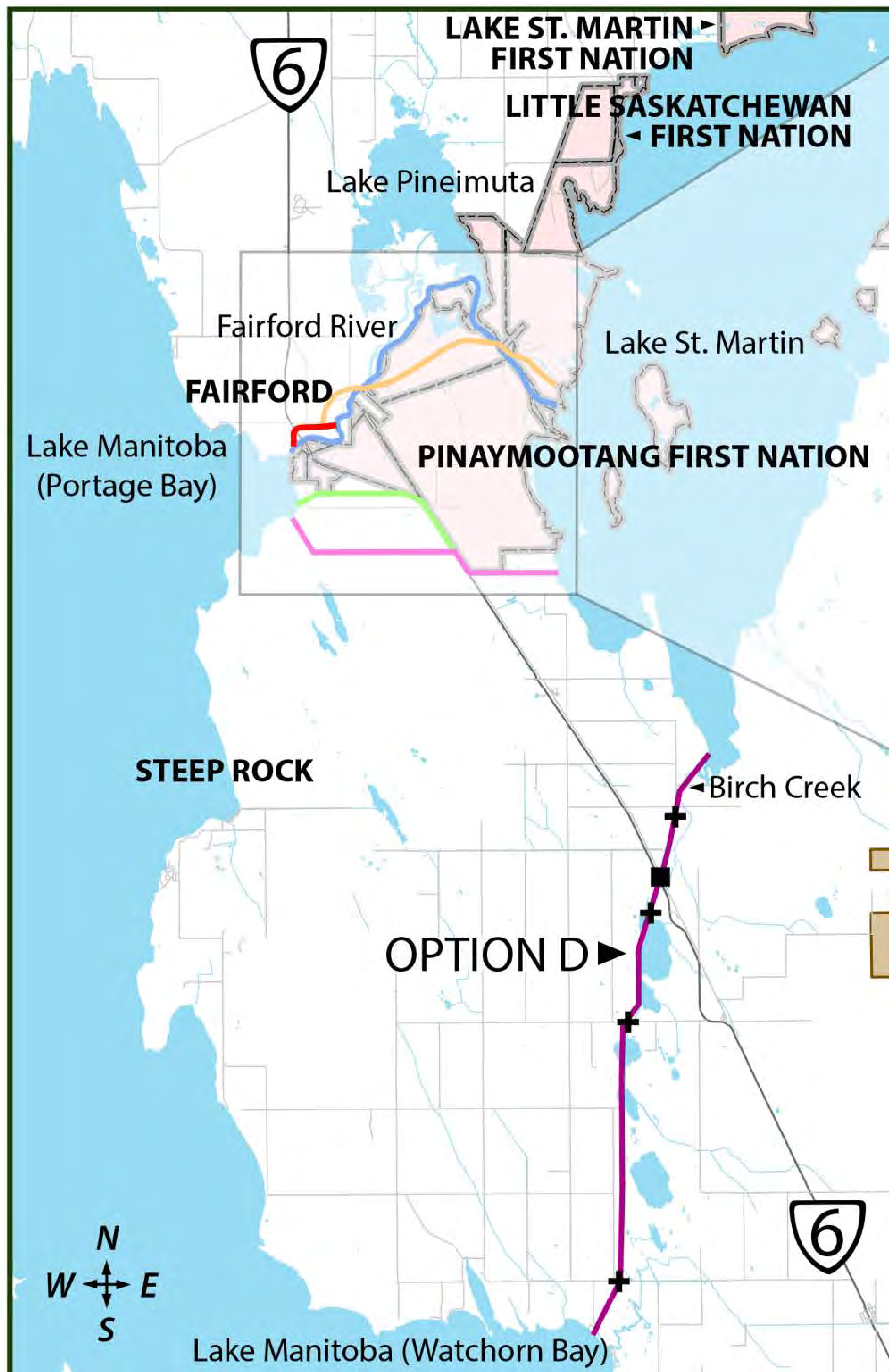
### Option C – Channel slightly less south of Pinaymootang First Nation

- A new channel connecting Portage Bay on Lake Manitoba with Lake St. Martin.
- Situated on privately held land and crown leased land.
- New control structure and bridge; new municipal bridges.
- More earth and rock excavation than Option B.
- 11.6 km channel; considered for a range of flows.



# PRELIMINARY OPTIONS

## Lake Manitoba Outlet Channel



### LEGEND

- Combined Control Structure and PTH Bridge
- Municipal Road & Control Structure
- + Municipal Road Bridge

Map showing Lake Manitoba Outlet Channel options



# PRELIMINARY OPTIONS

## Lake Manitoba Outlet Channel

### Option D – Channel following Birch Creek

- A new channel connecting Watchorn Bay on Lake Manitoba to the outlet of Birch Creek on Lake St. Martin.
- Situated on privately held land and crown leased land.
- New control structure and bridge; new municipal bridges.
- 22.8 km channel; considered for a range of flows.

### Option E – Bypass channel north of the Fairford River Water Control Structure

- New channel around the Fairford River Water Control Structure to the north and then merges with the Fairford River a short distance downstream.
- Situated on privately held land and crown leased land.
- New control structure and bridge.
- 2.15 km channel; considered for a range of flows to a maximum 3,750 cfs (greater flows not feasible).

### Option F – Expansion of the Fairford River and Fairford River Water Control Structure

- Widening of the Fairford River and Fairford River Water Control Structure (including dredging of the inlet channel).
- Situated primarily on Pinaymootang First Nation land.
- 18.7 km channel; considered for a range of flows.



# PRELIMINARY OPTIONS

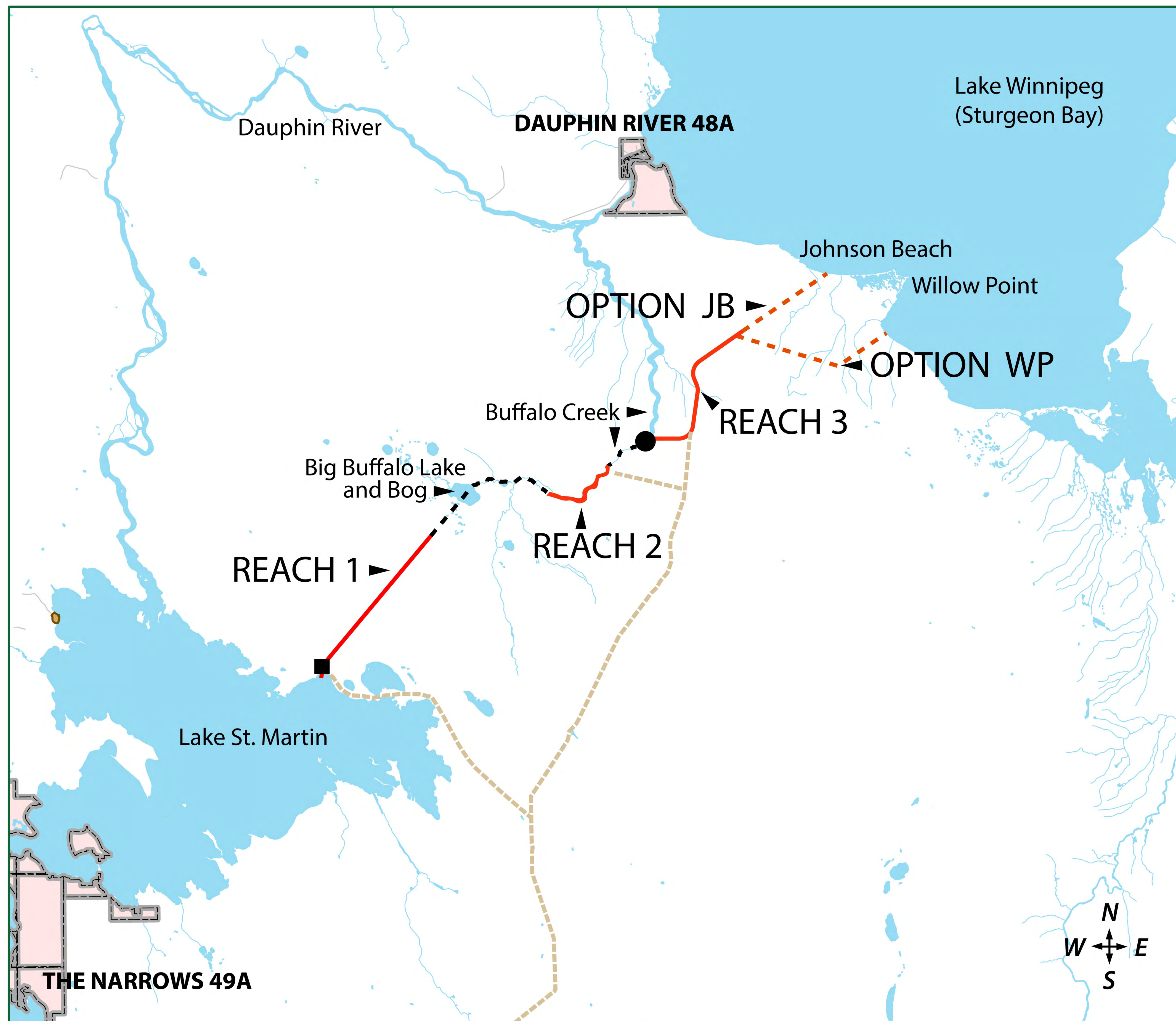
## Lake St. Martin Outlet Channel

- The Lake St. Martin Outlet Channel includes the following three reaches:
  - **Reach 1** – New inlet control structure and existing 6 km channel from Lake St. Martin to Big Buffalo Lake Bog.
  - **Reach 2** – 2.9 km length of Buffalo Creek downstream of Big Buffalo Lake.
  - **Reach 3** – New control structure and channel from Buffalo Creek to Lake Winnipeg.
    - **Option JB** – 8 km channel to Lake Winnipeg at Johnson Beach.
    - **Option WP** – 9.8 km channel to Lake Winnipeg south of Willow Point.
- The existing emergency outlet channel capacity is required to mitigate the effects of the 1961 increase to the Fairford River Water Control Structure outflows.
- Therefore, the existing Lake St. Martin outlet channel must be increased in capacity to accommodate an additional Lake Manitoba outlet channel.



# PRELIMINARY OPTIONS

## Lake St. Martin Outlet Channel

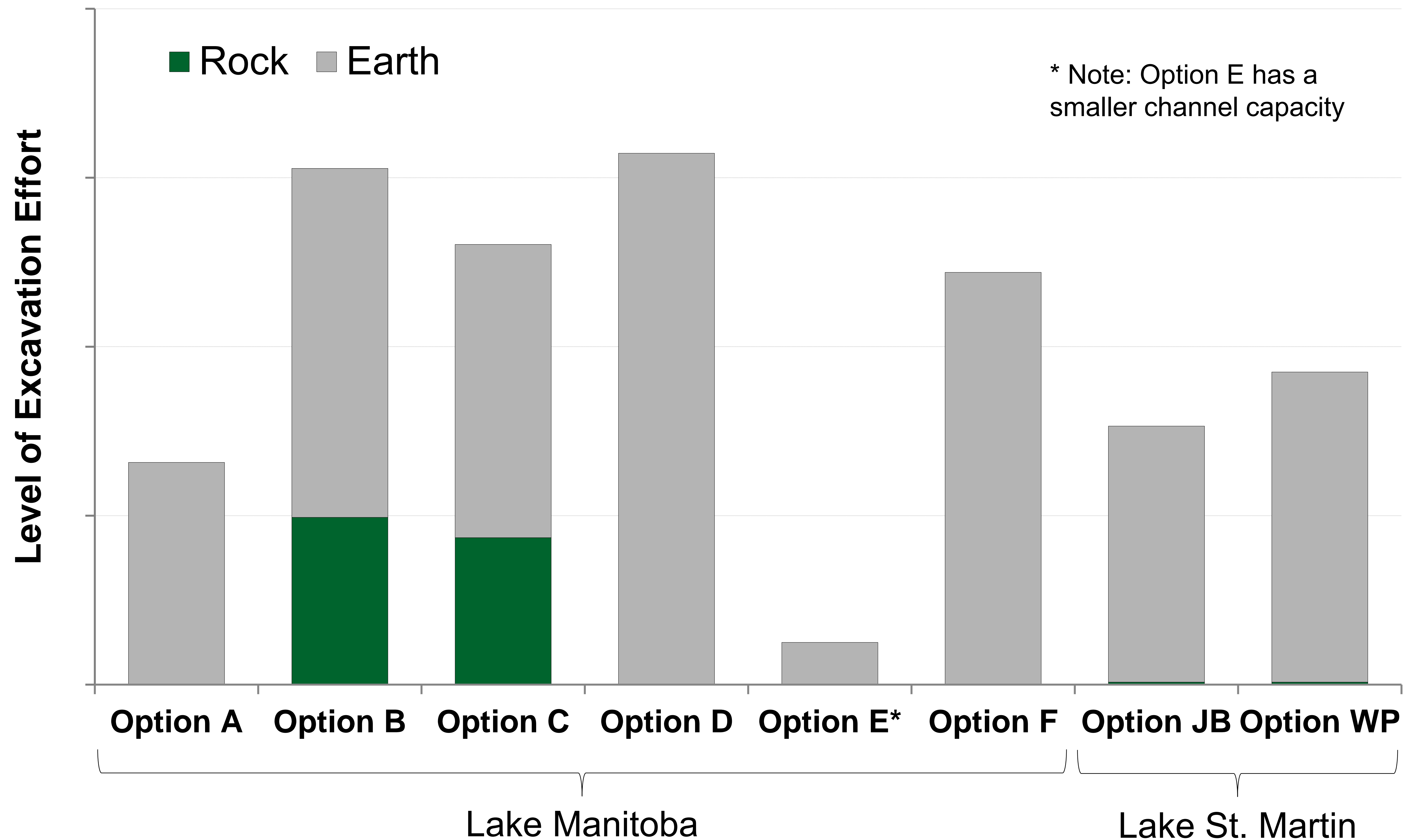


Map showing Lake St. Martin Outlet Channel options

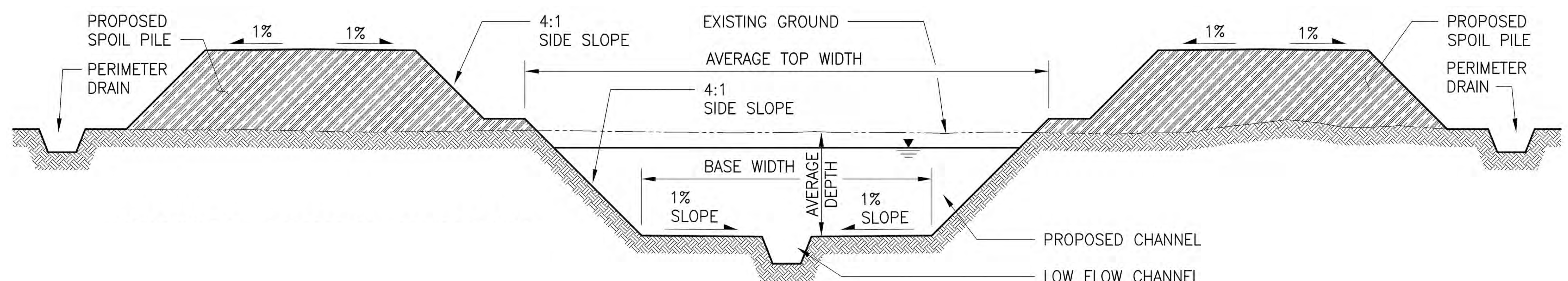


# OUTLET CHANNELS

## Relative Excavation Effort for Channel Options



### Typical Cross Section in Earth





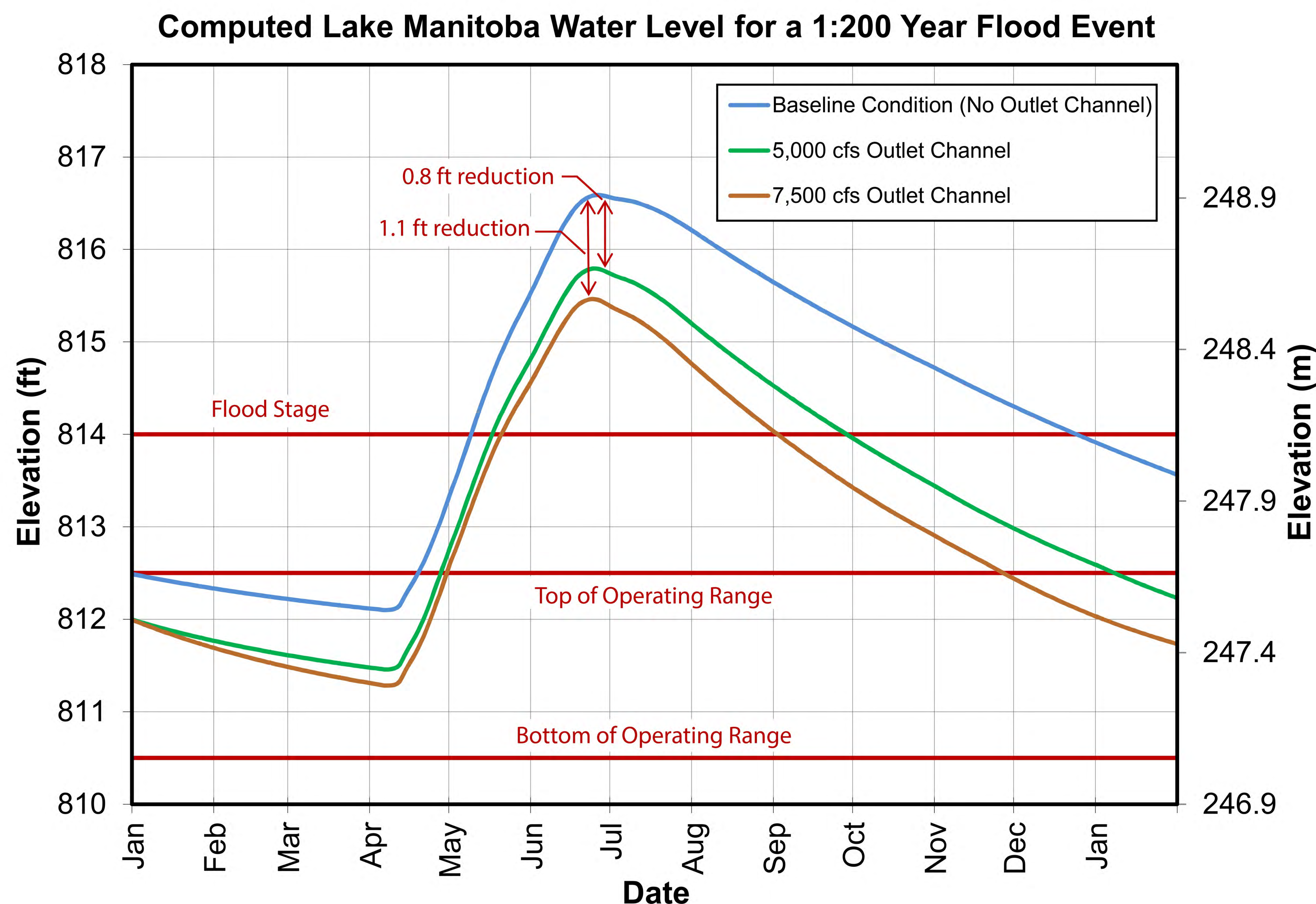
# CHANNEL CAPACITY

- Manitoba is committed to the construction of additional outlet capacity for both Lake Manitoba and Lake St. Martin.
- While the conceptual design process considered a range of flows, the assessment indicates that a new channel on Lake Manitoba with a capacity in the range of 5,000 to 7,500 cfs should be pursued.
- The assessment considered:
  - The overall Lake Manitoba / Lake St. Martin flood mitigation strategy.
  - Flood protection standards that are consistent with the recommendations of the Lake Manitoba / Lake St. Martin Review Committee.
  - Economic aspects.
- The combination of additional outlet capacity, individual and community protection, increased Lower Assiniboine River capacity and other initiatives will make a significant difference in mitigating impacts of large floods such as 2011 and 2014.
- Large scale outlets alone, such as one twice the proposed capacity, will not reduce water levels on Lake Manitoba below the 814 feet flood stage in a 1:200 year event.



# BENEFIT TO LAKE MANITOBA WATER LEVELS

- For a 200-year event, the peak water level without wind on Lake Manitoba without a new outlet channel would be about 248.9 m (816.6 ft).
- A new outlet channel would reduce the peak Lake Manitoba water level by:
  - 0.24 m (0.8 ft) for a 5,000 cfs channel.
  - 0.34 m (1.1 ft) for a 7,500 cfs channel.



The magnitude of these peak level reductions would be very similar for floods ranging from a 100 to a 500-year event.

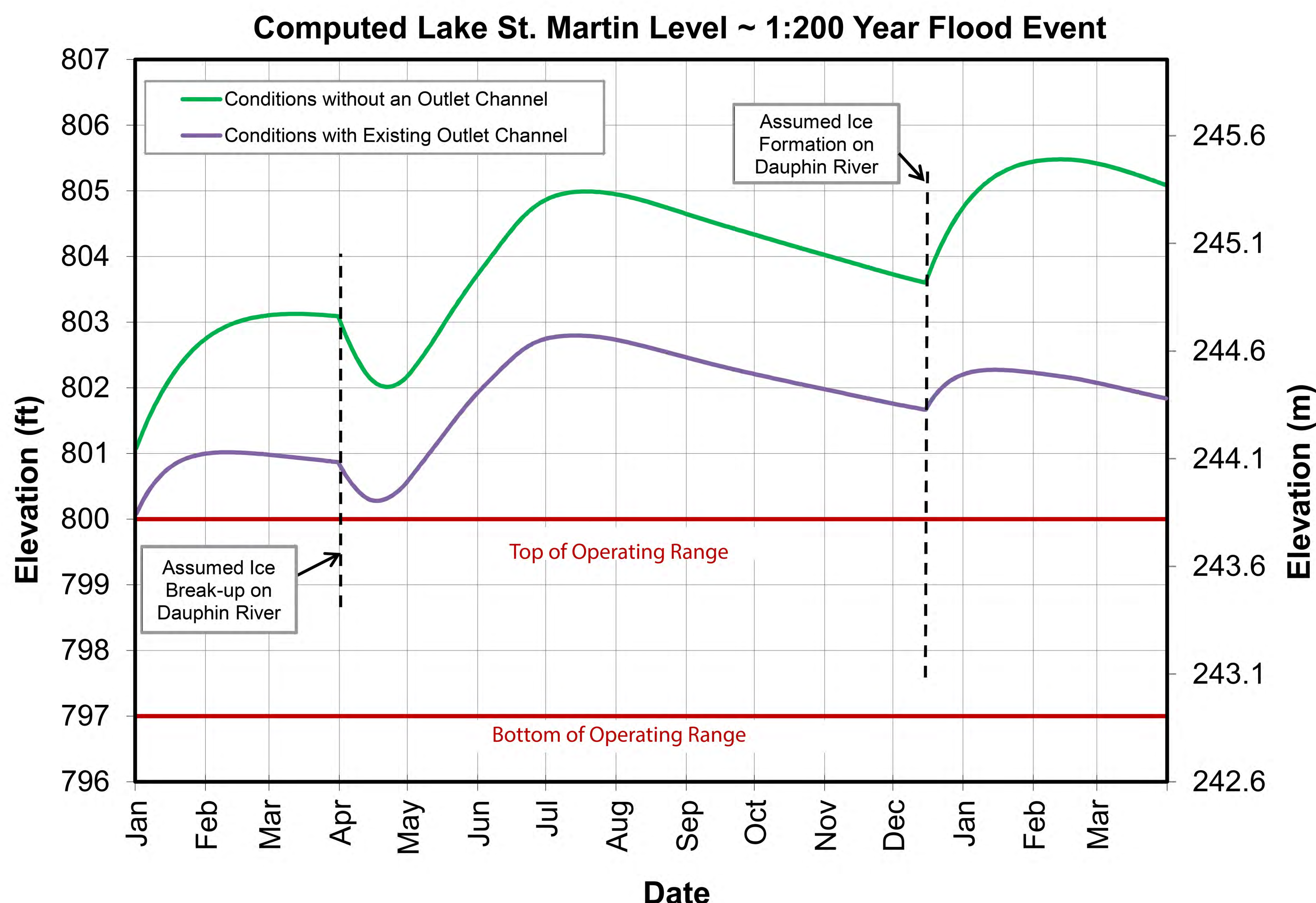
The 2011 flood on Lake Manitoba was estimated to be greater than a 300-year event. The peak water level without wind in 2011 was 249.1 m (817.2 ft).

Note: Additional lowering of Lake Manitoba water levels may be achieved by increasing the current capacity of the Lower Assiniboine River.



# BENEFIT TO LAKE ST. MARTIN WATER LEVELS

- For a 200-year event, the peak water level without wind on Lake St. Martin without the emergency outlet channel would be about 245.5 m (805.4 ft).
- The existing emergency outlet channel will reduce the 200-year peak Lake St. Martin level by 0.8 m (2.7 ft).
- This peak level reduction would be very similar for all options since a Lake Manitoba outlet channel would be combined with an expanded Lake St. Martin outlet channel.



The magnitude of these peak level reductions would be very similar for floods ranging from a 100 to a 500-year event.



## ADDITIONAL BENEFITS OF LAKE MANITOBA AND LAKE ST. MARTIN CHANNELS

- Additional Lake Manitoba and Lake St . Martin outlet capacity provides greater flexibility in operating the provincial water control system and results in benefits to the Lower Assiniboine River, including the City of Winnipeg .
- Additional outlet capacity and individual flood protection around Lake Manitoba helps mitigate the effects of the Portage Diversion on Lake Manitoba water levels.





# ESTIMATED COSTS (\$MILLIONS) OF OUTLET CHANNEL OPTIONS

Lake Manitoba Flow Range of 5,000 to 7,500 cfs  
Lake St. Martin Flow Range of 9,000 to 11,500 cfs

		Bridge/ Control Structures	Excavation	Access	Land Acquisition	Construction Camp	Mitigation/ Revegetation	Eng. & App./ Contingency	Total Costs
Lake Manitoba	Option A	9 - 14	32 - 51	7 - 9	1 - 2	2 - 3	7 - 11	27 - 44	85 - 134
	Option B	6 - 8	91 - 143	2 - 3	1 - 2	4 - 7	7 - 11	58 - 92	169 - 266
	Option C	6 - 8	78 - 124	4 - 6	1 - 2	4 - 6	7 - 10	51 - 82	151 - 238
	Option D	7 - 10	63 - 97	8 - 11	1 - 2	4 - 5	10 - 14	48 - 73	141 - 212
	Option E <sup>(1)</sup>	8 - 14	7 - 11	--	0 - 1	0 - 1	2 - 3	5 - 15	22 - 45
	Option F	16 - 27	112 - 190	4 - 7	2 - 3	6 - 10	16 - 27	83 - 141	239 - 405
Lake St. Martin	Option JB	15 - 21	32 - 52	35 - 40	--	4 - 5	8 - 11	48 - 67	142 - 196
	Option WP	15 - 21	38 - 60	35 - 40	--	4 - 6	9 - 12	52 - 73	153 - 212

- Notes:**
- (1) Cost estimate for Option E based on a flow range of 2,500 cfs to 3,750 cfs.
  - (2) Costs include land purchase, earth and rock excavation, rock riprap to reduce erosion, control structures, bridges, access roads and environmental mitigation costs.
  - (3) Total cost includes 20% for Engineering & Approvals and 30% for Contingency.
  - (4) A combination of one Lake Manitoba & one Lake St. Martin option is required.
  - (5) Lake St. Martin options include expansion to existing emergency channel to accommodate Lake Manitoba outlet channel options.



# POTENTIAL ENVIRONMENTAL CONCERNS

Construction and operation of an outlet channel between Lake Manitoba and Lake St. Martin will result in various physical, bio-physical and social environmental concerns.

Each channel option was assessed and rated on a preliminary understanding of the potential risks and concerns. This information will be examined in greater detail with the intention of modifying the design to help mitigate identified concerns.

Potential Environmental Risks/Concerns		Lake Manitoba						Lake St. Martin	
		Option A	Option B	Option C	Option D	Option E	Option F	Option JB	Option WP
● low ● medium ● high	Rating	6	1	2	3	4	5	2	2
<b>Access</b> Disturbance to PTH 6 and municipal roads during construction		●	●	●	●	●	●	●	●
<b>Fish Habitat</b> Alteration or loss of fish habitat due to structures, shoreline excavation, altered flow patterns, flooding, and water quality changes		●	●	●	●	●	●	●	●
<b>Flooding</b> Flooding of lakes, creeks, and wetland complexes		●	●	●	●	●	●	●	●
<b>Groundwater</b> Seepage of groundwater into the channel may lower the water table and affect groundwater wells in the vicinity of the channel		●	●	●	●	●	●	●	●
<b>Land Use</b> Land acquired for the project would affect current and adjacent land use		●	●	●	●	●	●	●	●
<b>Sedimentation</b> Potential increases in shoreline, lake bed and creek erosion can have an adverse effect on fish and other aquatic biota		●	●	●	●	●	●	●	●
<b>Vegetation</b> Loss due to clearing, excavation, blasting, introduction of weed species and dust settling on adjacent vegetation during construction		●	●	●	●	●	●	●	●
<b>Water Quality</b> Increases in organic matter, changes in dissolved oxygen, pH levels and methylmercury		●	●	●	●	●	●	●	●



# PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

## Lake Manitoba Outlet Channel

### Channel Capacity

- Designs should consider capacities in the 5,000 to 7,500 cfs range.
- To be refined in the next stage of design.

### Alignments

- Options C and D
  - Both options should be considered for more detailed evaluation as part of the next stage of design based on their cost effectiveness and high environmental ratings.
  - Preliminary costs range between \$141 Million and \$238 Million.





# PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

## Lake St. Martin Outlet Channel

### Permanent Channel

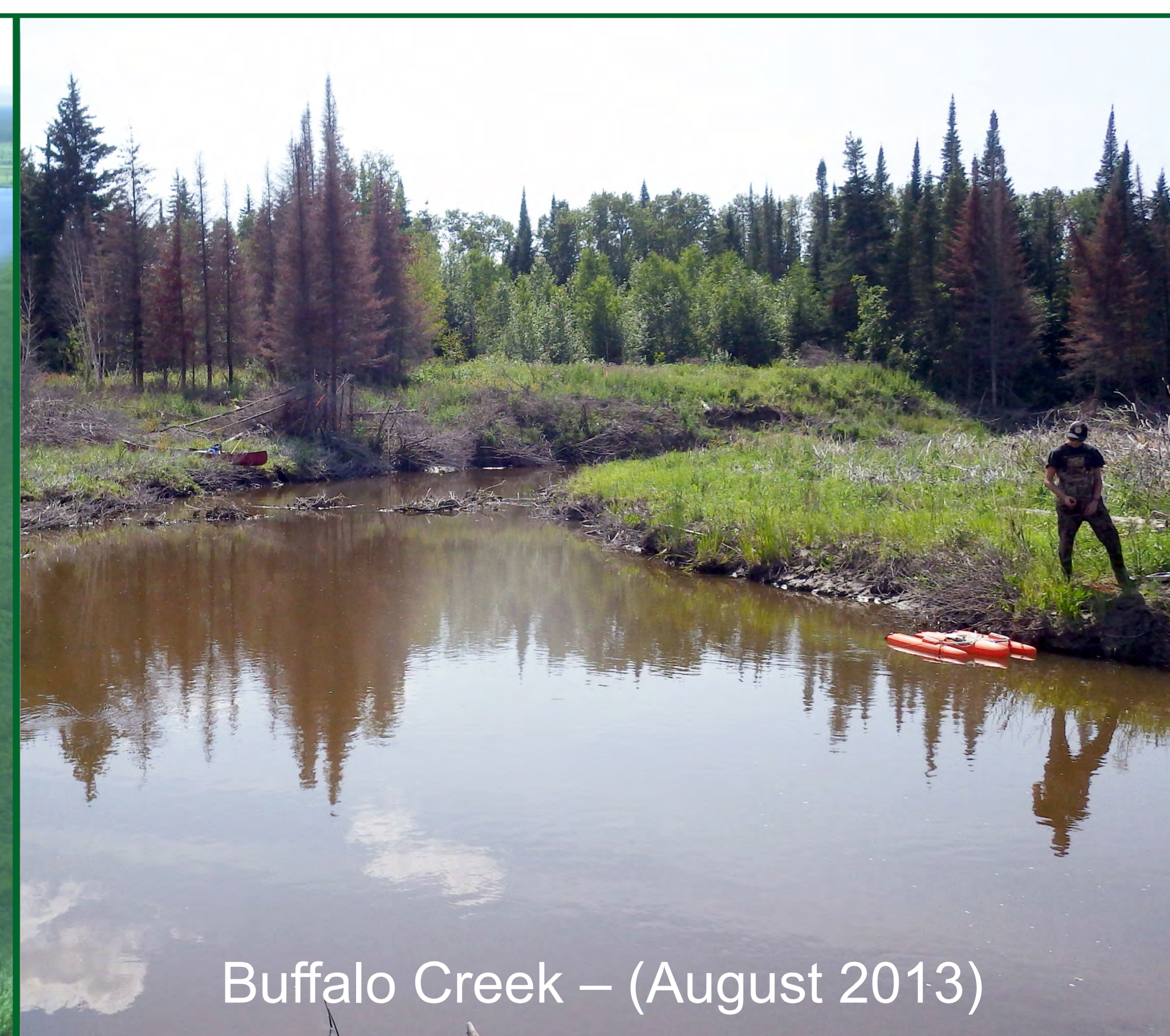
- The Lake St. Martin Emergency Outlet Channel should be made permanent with additional capacity to accommodate the increased inflows from a new Lake Manitoba outlet channel.
- A control structure and permanent access road should be constructed.
- Preliminary costs range between \$142 Million and \$212 Million.

### Reach 3 Options

- Options for the Reach 3 outlet at Johnson Beach and south of Willow Point have similar ratings, therefore, both should proceed for more detailed evaluation.
- The Dauphin River First Nation has indicated concerns with the Johnson Beach option.
- At this stage, the Willow Point option is preferred.



Big Buffalo Lake – (July 2011)



Buffalo Creek – (August 2013)



Johnson Beach & Willow Point – (October 2013)



# NEXT STEPS SCHEDULE

## The next stages of the project include:

- Aboriginal consultations.
- Environmental and regulatory reviews.
- Land acquisition.
- Completion of the design.
- Further public engagement.
- Construction.



Lake St. Martin Channel – (May 2012)



Main Market Road Bridge downstream of the Fairford River  
Water Control Structure – (July 2011)



# SHARING YOUR PERSPECTIVES

The project team would like to know your thoughts based on the information that has been shared here today.

Your input/feedback will help us as we proceed with further work on the design.

- Comment forms are available for you to fill out.
- Forms can also be submitted electronically or by mail, so long as they are received before October 18, 2014.
- Details are provided on the comment form. Please ask a project team member to help you if you have any questions.

**Contact information:** [feedback@floodstudy.ca](mailto:feedback@floodstudy.ca)

**Mailing address:** Colin Siepman, P.Eng., KGS Group  
KGS Place  
3rd Floor - 865 Waverley St.  
Winnipeg, MB R3T 5P4

## THANK YOU!