Perth-Andover - Ice Jam Study

Village of Perth-Andover

April 1, 2015

Background

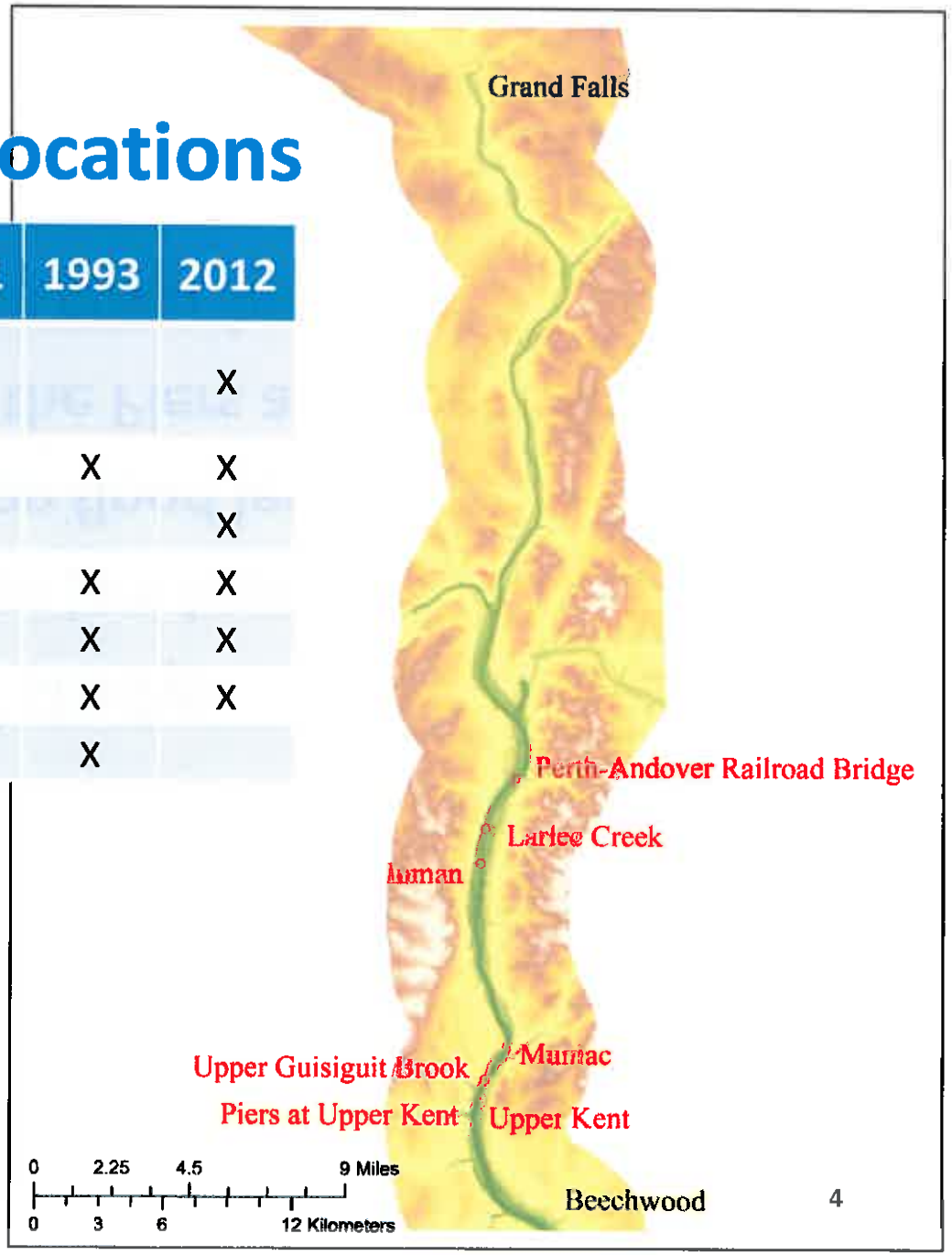
- March 2012 a record breaking ice jam flood impacted the Village of Perth- Andover.
- Provincial response included dwelling relocation, improvements to monitoring and forecasting, physical berm investigations at key locations, an emergency response plan for the Tobique First Nations, and a study of ice jam flooding risks for Perth- Andover.

Ice Jam Flooding Study

- Investigated the potential for mitigating or reducing ice jam flood risk
- Four components of study:
  1. Identify common ice jam locations
  2. Effect of dredging on flood levels
  3. Effect of removing the Piers at Upper Kent
  4. Effect of artificial ice cover breakup

1. Common Ice Jam Locations

	1987	1991	1993	2012
Perth-Andover Railroad Bridge Piers	X	X		X
Larlee Creek		X	X	X
Inman		X		X
Muniac	X	X	X	X
Upper Guisiguit Brook	X		X	X
Upper Kent			X	X
Piers at Upper Kent			X	



Causes

Ice jams occur when ice is forced into a small area or slowed down; narrow river sections, river bends, shallow flow depths, and physical obstructions

2. Effect of Dredging

- Common Ice Jam locations, candidates for dredging to improve water and ice conveyance
  - Perth-Andover Bridge not considered because no accumulation
  - Dredged to 1989, last known elevation not bedrock
- Result: No effect on water levels during 2012 event. There may be improvements if dredging occurred below 1989 elevation. Detailed riverbed geotechnical surveys to bedrock required.

3. Effect of Pier Removal

- Piers at Upper Kent removed to determine effect on:
  - Freeze-up ice thickness distribution for 2011-12 winter using 2013 ice thickness measurements.
  - Model runs using 2012 ice jam event.
- Result: When the piers were removed, the ice thickness did not significantly influence water levels during the 2012 breakup ice jam event. Testing with an ice jam event that did reach piers may result in different conclusions

4. Artificial Breaking of Ice Cover

- Ice cover broken artificially before natural breakup and allowed to transport downstream, providing room for naturally broken ice
- Result: A 1.0 m reduction in water levels at Perth-Andover during the 2012 ice jam event when 25-30 km (16-19 miles) of ice broken. Almost no change for less ice broken. A slight decrease if the Piers at Upper Kent were removed. Broken ice could greatly impact ice and flow conditions and communities in the river below Beechwood.

Summary

- 7 locations identified as having regularly occurring ice jams, each with physical features making it prone to jamming
- Returning bed elevations (dredging) to 1989 level in ice jam prone areas has no significant effect on flood levels
- Removing the Piers at Upper Kent
  - Has no significant effect on freeze-up ice thickness in the vicinity of the Piers at Upper Kent
  - Has no significant effect on 2012 ice jam flood levels

Summary

- Artificially breaking the ice cover from Beechwood to 25-30km above, before natural breakup, can reduce flood levels by ~1.0m in an event like the 2012 ice jam.
  - Removing the Piers at Upper Kent will also slightly improve the overall reduction in flood levels from artificial ice cover breakup
  - The risks posed to downstream communities are unknown and the impacts on ice and flows could be great.

ELG Conclusions

- Adjustments to the natural river environment would be cost prohibitive as related to common ice jam locations
- Further understanding the effects of dredging would require extensive geo-technical work and drilling. Costly dredging would be required annually.
- Current modeling suggests pier removal provides only slight reductions in the water level at Perth-Andover from an ice jam event like 2012. Removal of the piers does not appear to provide a cost effective reduction to flooding in Perth-Andover.
- Based on the 2012 ice jam, some reduction in water level would result from 25-30 km of artificial ice cover breakup. Upwards of $1M per year expense for ice cover breakup would be needed. Artificial ice cover breakup would be challenging to implement in a safe and effective manner and it poses unacceptable (and unknown) risks to downstream communities and infrastructure.