Harrington Dam
Class Environmental Assessment

Public Information Centre #2

Upper Thames River Conservation Authority
Harrington Hall and Library
May 12th, 2016 7:00 p.m. to 9:00 p.m.

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Class Environmental Assessment Process and Problem Statement

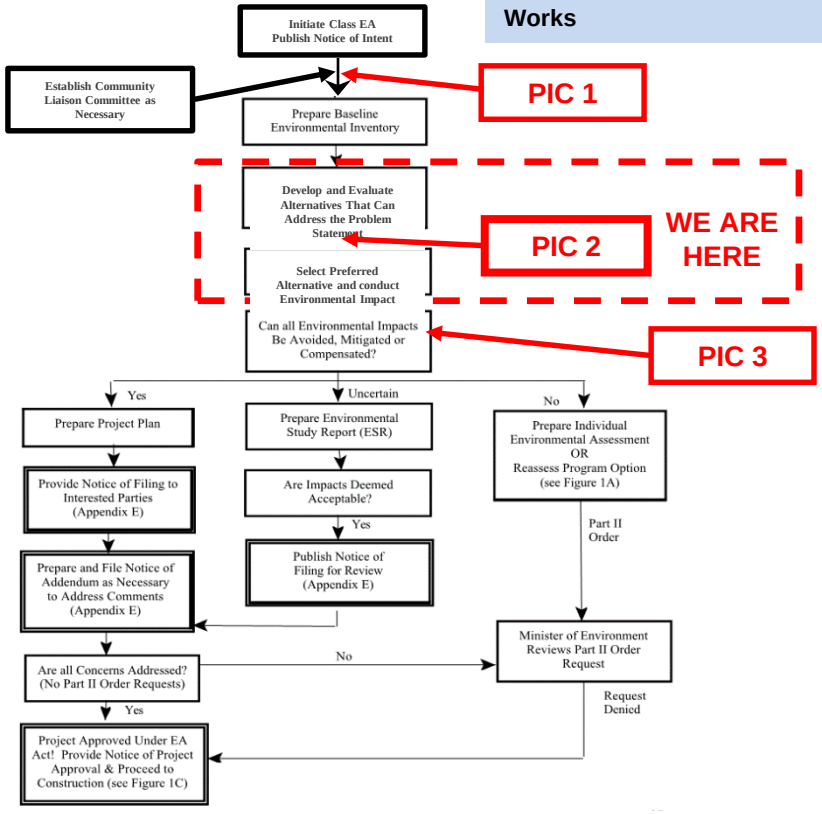
Problem Statement

Significant concerns related to the structural integrity and hydraulic capacity of the Harrington Dam have been identified through recent engineering assessments.

- ***Acres International. July, 2007***. *Dam Safety Assessment Report for Harrington Dam: Identified issues with insufficient spillway capacity, spillway instability and embankment stability*
- ***Naylor Engineering Associates. September 2008***. *Geotechnical Investigation Harrington Dam Embankment Stability Assessment: The existing dam does not meet current standards and is not considered stable under existing conditions*

A Class Environmental Assessment has been initiated to evaluate a range of alternatives to address the identified issues in consideration of the environmental, social, economic, and technical aspects of the dam.

Class EA Process for Conservation Ontario Class Environmental Assessment for Remedial Flood and Erosion Control Works



Criteria and Evaluation

Information Highlights

Technical/Engineering	Natural Environment
Flooding Impacts/Enhancement Geomorphology/Sediment Transport Protection of Infrastructure Constructability Approvability	Aquatic Habitat Impacts/Enhancement Terrestrial Habitat Impacts/Enhancement Wildlife and SAR Impacts/Enhancement Groundwater Impacts/Enhancement Water Quality Impacts/Enhancement
Social/Cultural	**Economic**
Impact to Private Property Impact to Public Safety Impact to Cultural/Heritage Features Recreational Impacts/Enhancement	Construction Costs Maintenance/Future Costs Availability of Funding

Primary Areas of Site Characterization

Environmental	Technical	Social
Water Quality	Hydraulics and Hydrology	Cultural Heritage
Flow Characteristics	Geomorphology	Archaeology
Vegetation and Wildlife	Sediment	First nations
Aquatic Biology	Structural	

Environmental

Information Highlights

Water Quality, General

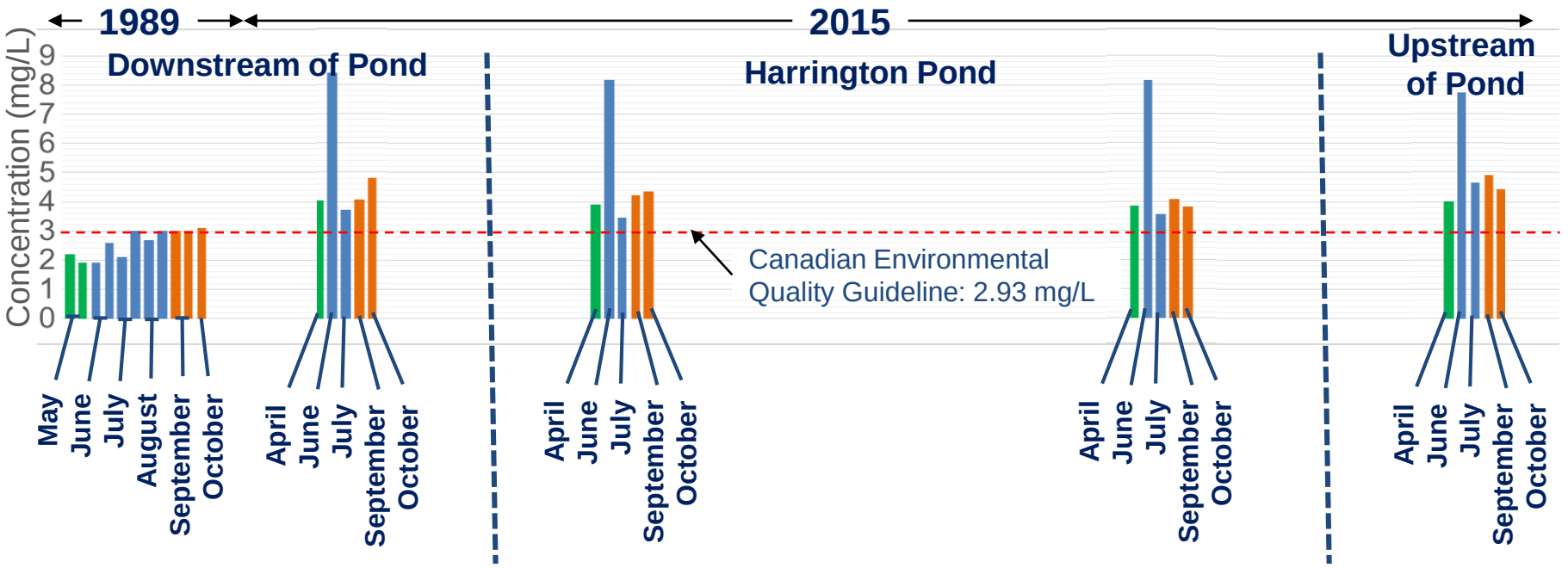
- 4 sampling locations (1 upstream of pond, 2 in pond, 1 downstream of pond), 5 samples were collected at each site

Results:

- General low levels for contaminants measured
  - All parameters were better than average compared with the Upper Thames River watershed for upstream, in, and downstream of pond

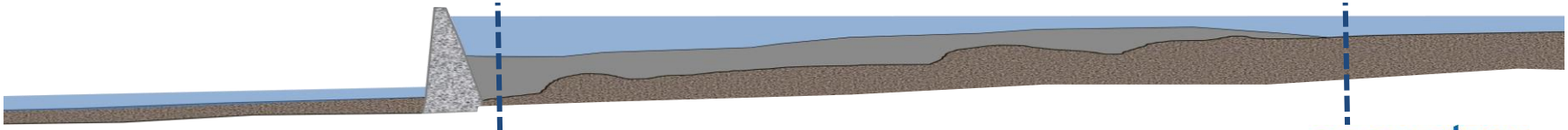
Environmental Information Highlights

Nitrate



What does this mean?

- That all nitrate levels are all higher than the CEQG
- That levels are highest in June
- That summer levels are higher downstream compared to upstream
- This indicates that the pond has an impact on nitrate levels at certain times of the year



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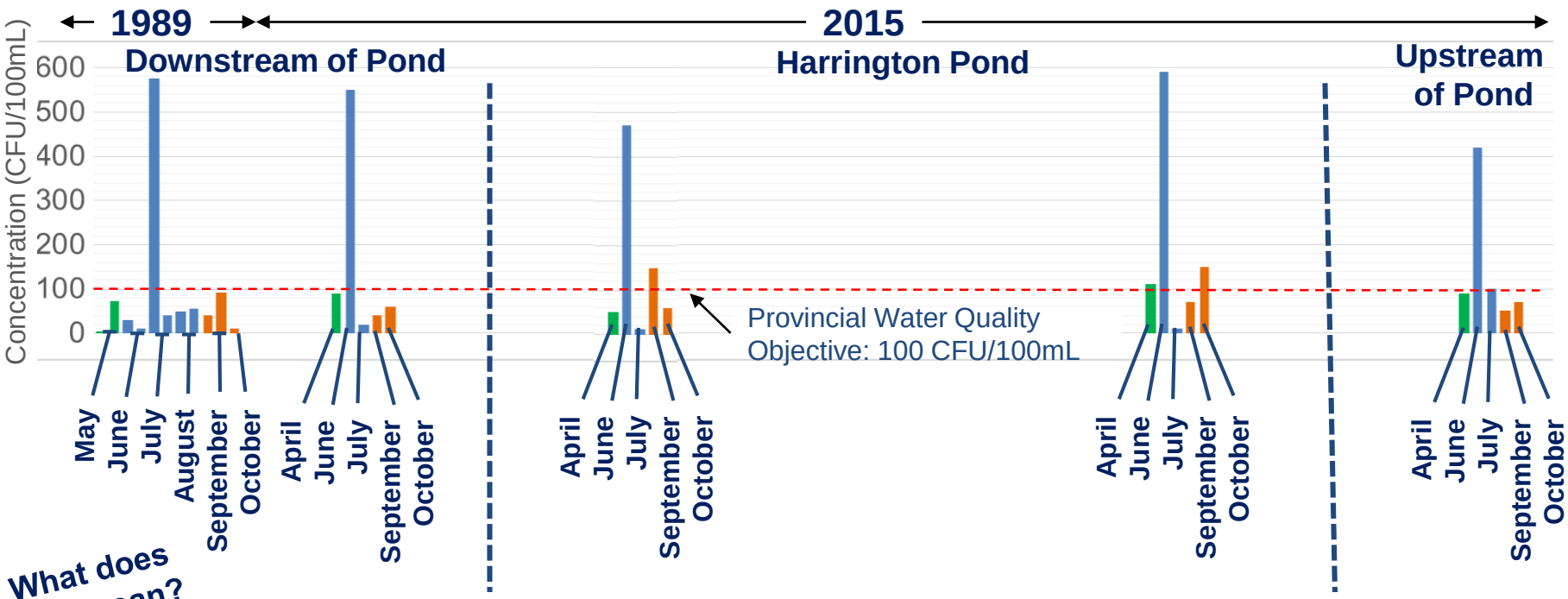
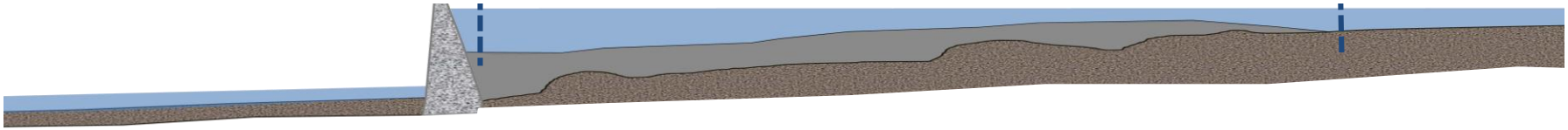
Environmental E.Coli Information Highlights



What does this mean?

- That all E.coli levels are all higher than the PWQO targets in June and September
- That levels are highest in June
- That summer levels are higher in the pond and downstream compared to upstream
- This indicates that the pond has an impact on E.Coli levels at certain times of the year (June and Fall)



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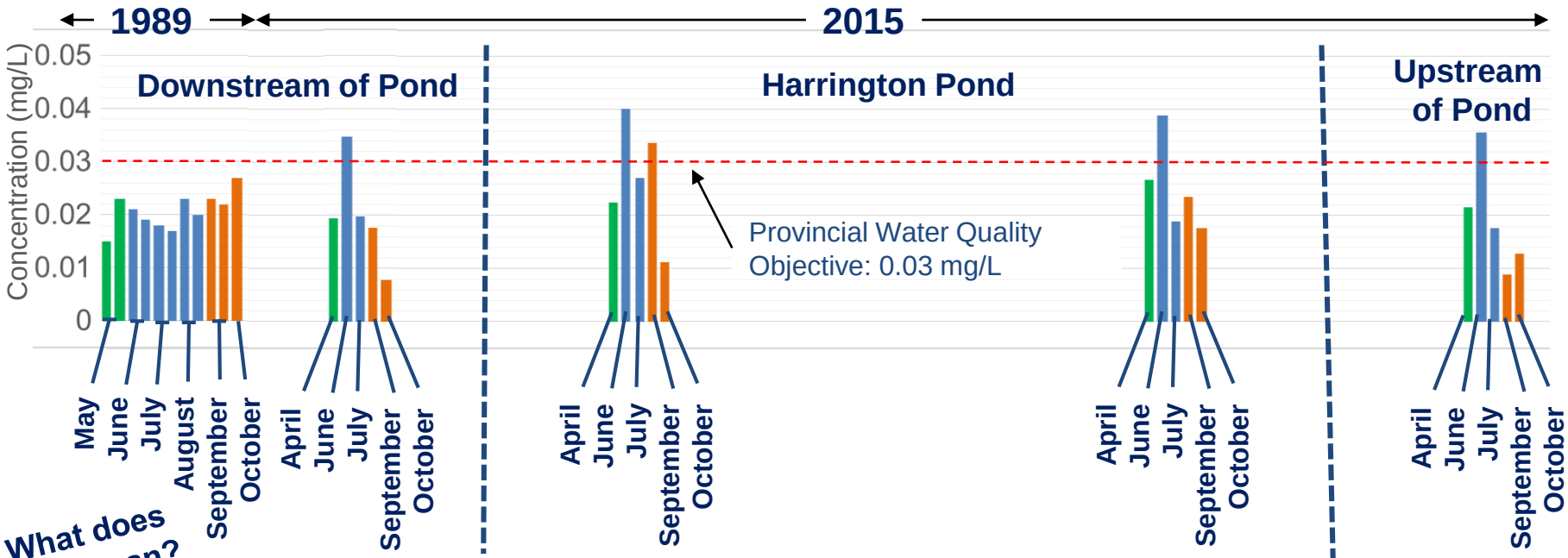
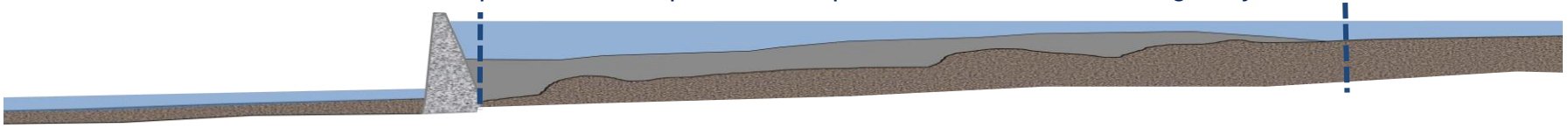
Environmental Information Highlights

Total Phosphorous



What does this mean?

- That Phosphorous levels are all higher than the PWQO targets in June
- That levels are highest in June
- That summer levels are highest in the pond
- This indicates that the pond has an impact on Phosphorous levels overall during the year



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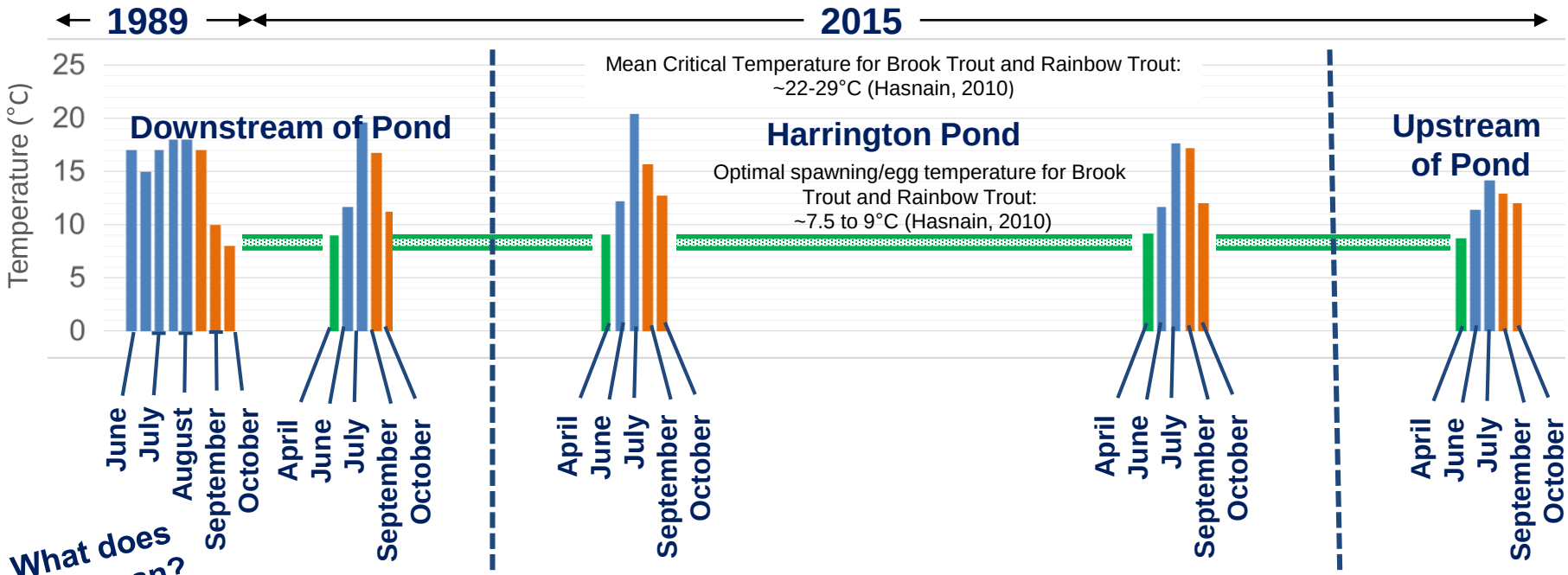
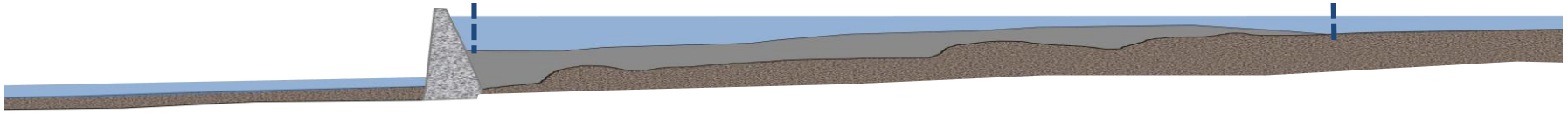
Environmental Information Highlights

Temperature



What does this mean?

- That water temperatures are highest in the pond
- That water temperatures are highest in June and September
- That temperatures are higher downstream than upstream
- This indicates that the pond appears to raise water temperatures. This occurs though solar heat gain.



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Environmental

Information Highlights

Flow Characteristics

- Outflow contributed on average 10% of the total flow out of the Trout Creek Subwatershed
- Flow rates downstream of the dam are resilient to drought
- Groundwater input to the pond increases baseflow output downstream of the dam (i.e., base flow increases ~ 7% between upstream and downstream of pond)

Environmental

Information Highlights

Vegetation and Wildlife

- No Species at Risk or of Special Concern were found during the investigation
  - No critical habitat for sensitive bird species
  - Site is within 100 m of a Provincially Significant Wetland
- Southeast edge of pond is part of larger Oxford Heritage System
- Inventory Findings:
  - 219 plant species found, 40% of species found are non-native
  - 42 species of birds, mostly common breeding or permanent residents
  - Barn Swallow (Threatened) was seen, but not found nesting in the study area
  - Public reports of Snapping Turtles (Special Concern) using the reservoir

Environmental

Information Highlights

Aquatic Biology

- Classified as Shallow Aquatic (i.e., < 2 m depth)
- Pond/Reservoir does not support any native rooted aquatic plants
- Wetland emergent plants found along the pond's shores are common in the area
- Large population of Common Carp contribute to uprooting of plants
- Many of these plant could naturally re-establish along Harrington Creek if disturbed

Environmental

Information Highlights

Fisheries Resources

- Electrofishing conducted in 2015 (April, July, August, October, and November)

Brook Trout

Rainbow Trout

Image Source: Mandrak and Crossman, 1992

<u>Upstream of Dam (7 species recorded total):</u>

- Brook Trout and Mottled Sculpin
- Habitat suitable for cold water species

<u>Downstream of Dam (30 species recorded total):</u>

- Rainbow Trout, Brook Trout, and Sculpin
- Permanent and seasonal habitat for warm water species
- Minnow and darter (year-round residents)
- Large and Smallmouth Bass, Northern Pike, and Yellow Perch (seasonal residents)
- Coldwater species not likely able to reproduce in this reach

- A large population of Common Carp (an invasive species) were found within the pond

Environmental

Information Highlights

Benthic Resources

- Sampling was conducted in the spring and fall of 2015
- Sample records with the calculated Family Biotic Index (FBI) are shown below:
- Water quality indicators are
  FAIR to FAIRLY POOR
  upstream/downstream of the pond

What does this mean?

- That the FBI is 'Fair' upstream of the pond
- That FBI is 'Poor' to 'Fairly Poor' downstream of the pond
- This indicates that the pond has an impact the quality of the benthic resources

Water quality ranges for FBI values

FBI Value	Water Quality
< 4.25	Excellent
4.25 – 5.00	Good
5.00 – 5.75	Fair
5.75 – 6.50	Fairly Poor
6.50 – 7.25	Poor
> 7.25	Very Poor

Comparison for FBI values for Harrington CA, Trout Creek and UTRCA watersheds

Benthic Sample Location	Spring 2015 FBI	Fall 2015 FBI	Average FBI	Water Quality
Harrington Creek upstream of Harrington Pond	4.68	5.53	5.11	Fair
Harrington creek downstream of Harrington Dam	6.73	5.71	6.22	Fairly poor
Trout Creek watershed 2012	N/A	N/A	6.17	Fairly poor
UTRCA watershed 2015	N/A	N/A	5.68	Fair
Provincial Guideline (target only)	N/A	N/A	< 5.00	Good

Technical

Information Highlights

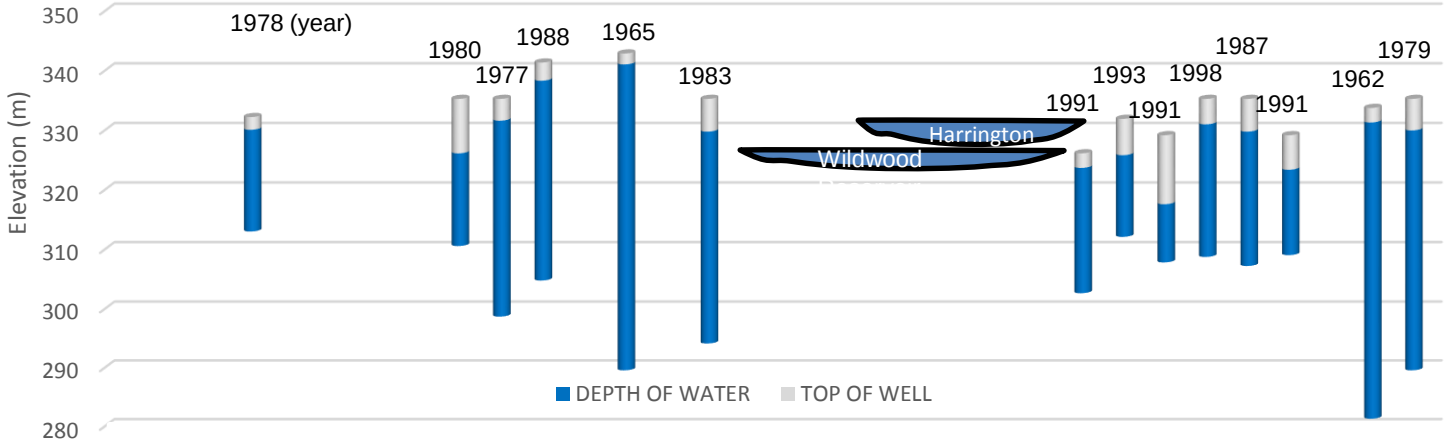
Groundwater

- Groundwater flows along a gradient, from south to north (towards Wildwood Reservoir)
- Soil is characterized as sandy; gravel occurs at the northwest edge
- Soil type suggests high infiltration, and high groundwater recharge

Well Information

- Approximately 22 wells exists in the vicinity of Harrington Pond
- Well water level data were plotted to determine the relative water levels in the area
- Additional work to inventory/map shallow wells will proceed after alternative selection

Well Information



Shallow Wells

- Were not inventoried
- Location of shallow wells will need to be determined
- Shallow well may be affected by a change in head pressure to the shallow aquifer
- Shallow well impacts can be mitigated by installation of deep wells

Technical

Information Highlights

Geomorphology

- Air photo analysis: no change in creek planform and minor change in pond planform between 1955 and 2013
- Three reaches were defined

Reach 1 (Downstream of dam):

- Trapezoidal cross sections set within deeper channel
- Riffle and pool bed sequences
- Cobble and gravel bed materials
- Well vegetated steep banks

Technical

Geomorphology

Reach 2 (Backwater area):

- Backwater influences from the pond extend ~ 80 m upstream
- Sediment covered bed ~ 56 m upstream of trail bridge
- Cross-sections were uniform in configuration
- Banks well vegetated with grasses and herbaceous plants

Reach 3 (Cedar forest):

- Cross-sections relatively wide and shallow
- Channel bed has riffles and shallow pools
- Planform is somewhat sinuous
- Banks well vegetated banks with herbaceous plants, mosses and cedar trees; woody debris in channel

Information Highlights

Technical

Information Highlights

Sediment Characteristics

Sediment testing was conducted in 2015 to investigate parameters such as:

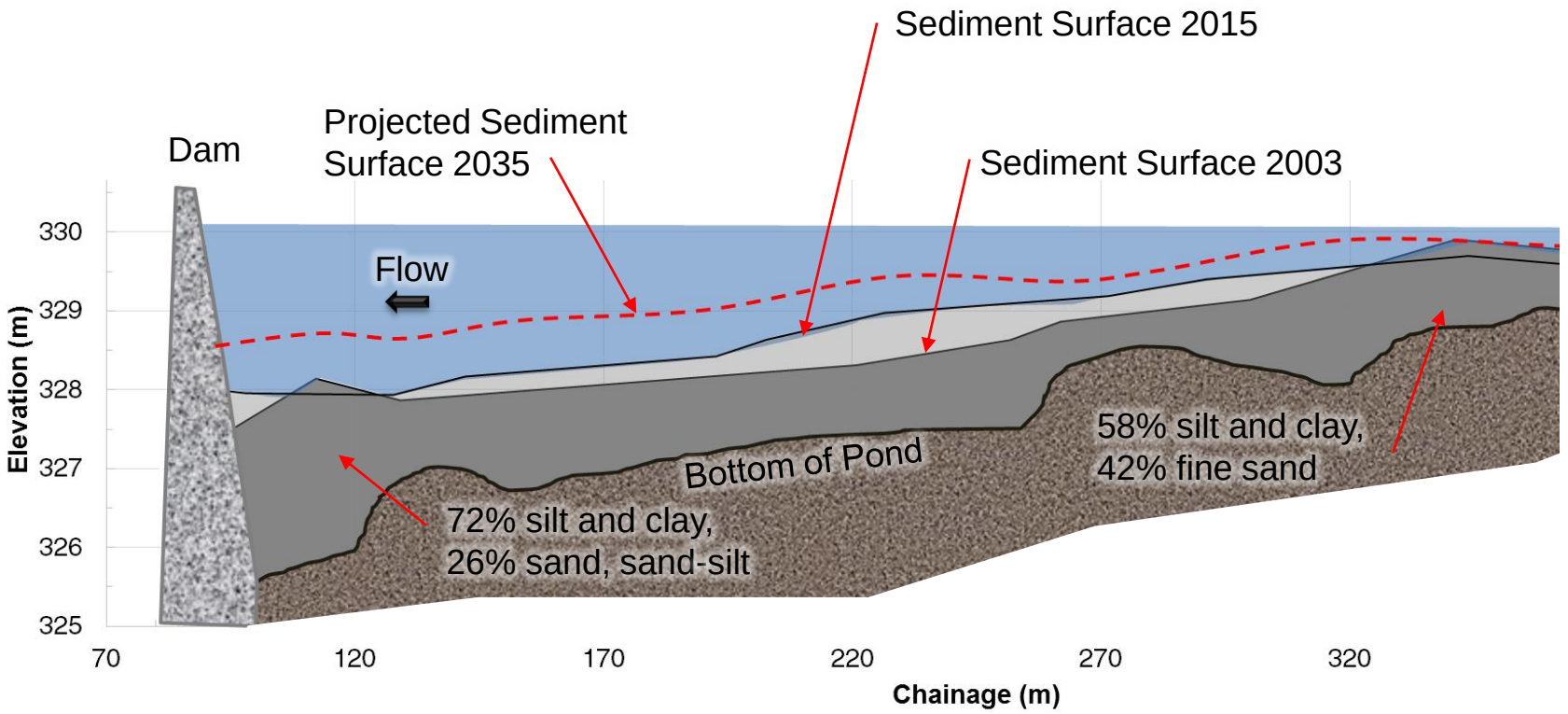
- metals and inorganics
- volatile organic compounds
- petroleum hydrocarbons
- Conductivity
- pH
- grain size analysis

Sediment test results were compared to Ministry of the Environment (MOE) Table 2 Standard, O. Reg. 153/04:

- Two parameters are outside of the MOE limit
  - Cyanide (weak acid dissociable)- over by 0.042 ug/g
  - Boron (hot water extraction)- over by 0.02 ug/g
- Therefore sediment disposal options are limited to:
  - Landfilling
  - Beneficial reuse (potential option but requires further investigation)

Sediment

Average sediment accumulation rate = 292 m³/year



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Technical

Information Highlights

Structural

- Dam impounded volume: 20,000 m^3 (small dam based on storage volume)
- Dam height ~ 4 m
- 65 m embankment on left side, 20 m embankment on right side
- Inflow design flood (IDF) criteria: 50 year, 3 day summer storm

Structural Condition (2002/2003 Dam Safety Assessment)

- Spillway does not have current capacity to pass the IDF
- Spillway structure does not meet stability criteria
- Insufficient freeboard at embankment crests and pedestrian bridge
- Right downstream embankment does not meet slope stability criteria
- Concrete spillway is generally in fair condition
- Last repairs were completed in 2000

Technical

Information Highlights

Updated Hazard Classification

2007: Dam hazard potential classification (DHC) for Harrington Dam was completed:

- Loss of Life: VERY LOW
- Economic and Social Losses: VERY LOW
- Environmental Losses: VERY LOW

2011: the Ministry of Natural Resources and Forestry updated the DHC criteria and procedure

2015: Update to the Harrington dam hazard potential classification:

- Life safety: LOW
- Property Losses: LOW
- Environmental Losses: LOW
- Cultural-Built Heritage Losses: LOW

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Social

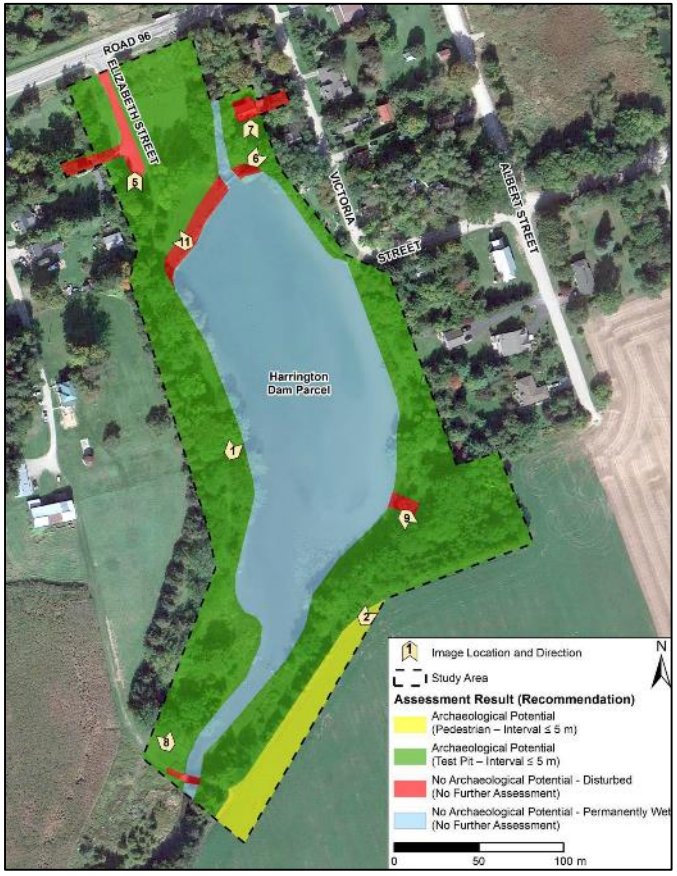
Information Highlights

Archaeology and First Nations

- Stage 1 Archaeological Assessment was carried out
- No prior archaeological assessments within 50 m of the study areas
- No prior identified archaeological sites within 1 km of the study areas
- Archeological potential was assessed using soils, hydrology, and landform considerations

Findings: The study areas would have been attractive to both Pre-Contact and Euro-Canadian populations as a result of close proximity to water sources, well drained soils and the diversity of local vegetation. The site was found to have archaeological potential.

Social



Information Highlights

- 56.5% of the site has archaeological potential, requires pedestrian and test pit survey if any work proposed in area
- 43.5% of the site has no archaeological potential (due to disturbance, or permanent water features)

Watershed Initiatives

Information Highlights

Initiative	Approach
2011 Trout Watershed Action Plan	A plan for targeting areas for rehabilitation, including cold water streams able to support a cold water fishery.
2008 Trout Creek Community based Watershed Strategy	To improve environmental health: Target priority areas, rehabilitate cold water streams, approach landowner participation, work with municipalities, involve students.
2008 Trout Creek Aquatic Enhancement Project	Created a shoal, planted 4700 aquatic plants along Trout Creek. Naturalization continued in 2010/2011 with the planting of 122 trees and 2800 wildflowers.
Private Land Restoration Program	5400 trees planted at 16 rural properties, local schools/ community groups planted over 2700 native shrubs/trees and 5000 aquatic plants.
Clean Water Program	Sine establishment in 2001 as a partnership between local municipalities, rural land owners completed 25 projects including fragile land retirement and erosion control.

Criteria and Evaluation

Information Highlights

Technical/Engineering	Natural Environment
Flooding Impacts/Enhancement Geomorphology/Sediment Transport Protection of Infrastructure Constructability Approvability	Aquatic Habitat Impacts/Enhancement Terrestrial Habitat Impacts/Enhancement Wildlife and SAR Impacts/Enhancement Groundwater Impacts/Enhancement Water Quality Impacts/Enhancement
Social/Cultural	**Economic**
Impact to Private Property Impact to Public Safety Impact to Cultural/Heritage Features Recreational Impacts/Enhancement	Construction Costs Maintenance/Future Costs Availability of Funding

Alternatives

Information Highlights

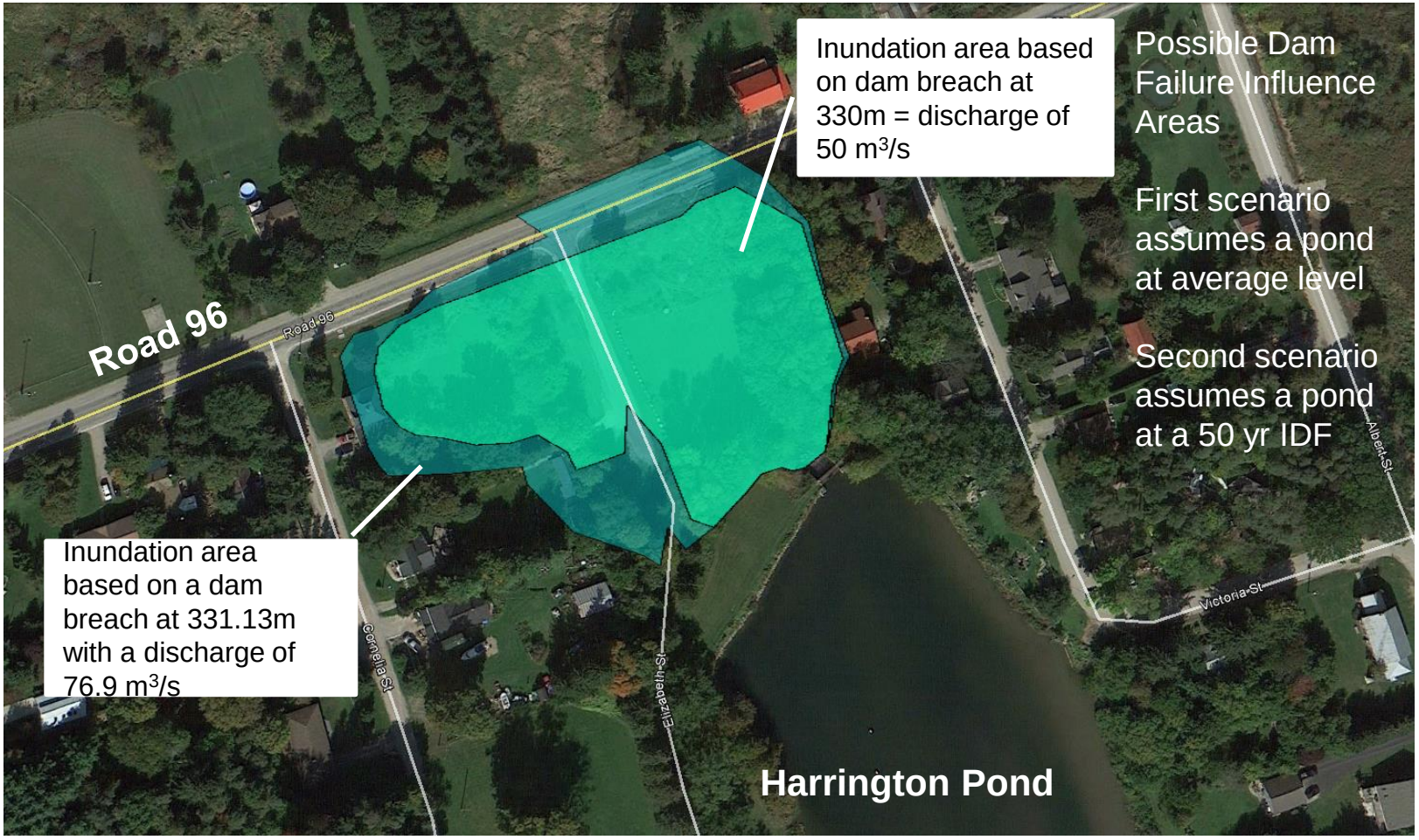
1) Do Nothing
2) Remove Dam and Install a Rocky Ramp
3) Remove Dam and Construct a Natural Channel
4) Remove Dam and Construct an Offline Pond and Natural Channel
5) Replace the Dam with a New Structure Downstream of the Existing Dam Location
6) Replace the Dam with an Earthen Dam of Lower Crest Elevation
7) Reconstruct the Existing Dam in Current Location with New Materials

Alternative 1 – Do Nothing

No intervention would be implemented

Opportunities	Constraints
No immediate cost	Does not meet dam safety guidelines
Maintains current aesthetic	Risk of failure – this can impact channel by flood, erosion and sediment
Maintains current recreational uses	Requires regular monitoring
Maintains current pedestrian pathways	Operational procedures will change in response to geotechnical concerns (fewer logs in place)
	Imposes an impediment to upstream fish passage
	Increase water temperatures seasonally
	Accumulates sediment, will require cleanout over time
	Impedes sediment transport

Predicted inundation limits in the event of a failure



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Do Nothing Considerations

- Under a worst case flood scenario IDF 50yr, there is potential for three buildings to be affected if the dam fails
- A monitoring program will need to identify indicators of future condition
- Loss of material or seepage through the dam and embankment will trigger the removal of stop logs to reduce pressure
- Possible lowering of the pond surface will need to be done to relieve pressure against the structure
- In the event of a failure, sediment will need to be mitigated, the site will need to be re-graded and the remains of the berm and structure will be removed
- Impacts will include the dispersion of sediment to downstream environmental features

Alternative 2 – Remove Dam and Install Rocky Ramp

Remove dam and install a rocky ramp, stabilize remaining channel and provide landscape restoration (off-line system)

Opportunities	Constraints
Removes the risk of dam failure	Imposes restoration costs (moderate)
Maintains current pedestrian flow and could provide new pedestrian pathways	Does not reflect the existing open water aesthetic
Removes barrier to upstream migration for some fish species	Has the risk of impacting shallow wells
Increases diversity of fish habitat in channel	
Improves terrestrial habitat	
Enables continuity of sediment transport	
Maintains creek temperatures	
Provides opportunity for new recreational areas and views	

Alternative 3 – Remove Dam and Construct a Natural Channel

Remove dam and construct a natural channel, provide landscape restoration (off-line system)

Opportunities	Constraints
Removes the risk of dam failure	Imposes restoration costs (moderate)
Restores a natural channel planform, profile and sections	Does not reflect the existing open water aesthetic
Provides access to upstream fish habitat for all species	Has the risk of impacting shallow wells
Provides diverse fish habitat in channel	
Enables continuity in sediment transport	
Maintains creek temperatures	
Improves terrestrial habitat	
Provides new recreational areas and views	
Provides opportunity for new pedestrian pathways	

Alternative 4 – Natural Channel with Offline Ponds

Remove dam, construct offline ponds and natural channel, provide landscape enhancements (off-line system)

Opportunities	Constraints
Removes the risk of dam failure	Imposes restoration costs (high)
Maintains current pedestrian flow and could provide new pedestrian pathways	Has the potential to impact shallow wells, but less risk due to the offline ponded area
Provides diverse fish habitat in creek and pond	
Improves terrestrial habitat	
Provides continuity of sediment transport through channel	
Reduces the risk of temperature impacts on downstream watercourse	
Partial ponded area and views can be maintained	
New recreational areas	

Alternative 5 – Replace Dam

Replace dam with a new structure downstream of the existing dam location (on-line system)

Opportunities	Constraints
Removes the risk of dam failure	Imposes restoration costs (very high)
Maintains current aesthetic and views	Sediment continues to accumulate (will require periodic clean-out)
Maintains current recreational areas	Impedes sediment transport
Option to provide fish passage (through a fish passage structure)	Continue to affect downstream water quality
Reduces temperature impacts downstream (through the provision of a bottom draw structure)	
No change in risk to shallow wells	

Alternative 6 – Lower Dam Crest With Natural Channel

Replace dam with an earthen dam of lower crest elevation (on-line system)

Opportunities	Constraints
Removes the risk of dam failure	Imposes restoration costs (very high)
Partially maintains current aesthetic	Sediment continues to accumulate (will require periodic clean-out)
Reduces solar heat gain compared to the existing ponded area	Impedes sediment transport
Reduces the magnitude of potential impacts in the event of a breach/failure	Reduces pond surface area (changes aesthetic water view)
Enhances the terrestrial landscape and habitat	No fish passage provided
Minimal risk to shallow wells	Continue to affect downstream water quality
Provides opportunity for trails	

Alternative 7 – Reconstruct Existing Dam

Reconstruct existing dam in current location with new materials (on-line system)

Opportunities	Constraints
Removes the risk of dam failure	Imposes restoration costs (very high)
Maintains current aesthetic, recreational areas and views	Sediment continues to accumulate (will require periodic clean-out)
No risk to shallow wells	Impedes sediment transport
	Continues to increase water temperatures downstream seasonally
	No fish passage provided
	Continue to affect downstream water quality

Funding Opportunities

- Upper Thames River Conservation Authority
- Provincial Water and Erosion Control Infrastructure (WECI) (by MNRF)
  - matching annual capital investments to maintain provincial dams and other flood and erosion control installations
  - targeted at projects that improve water quality
- Royal Bank of Canada Blue Water Project
  - local and community based groups ($1000 – $10,000)
- Community Fundraising

Other sources are available but they depend on type of alternative selected.

Next Steps and Contact Information

Next Steps for our project team include:

- **Compile and review feedback from this Public Information Centre**
- **Final criteria and alternatives evaluation completed based on public feedback**
- **Select 'Preferred Alternative' and evaluate environmental impacts**
- **Public Information Centre #3**
- **If impacts can be mitigated, work will proceed to completion and filing of Project Plan**

To provide feedback and comments to the project team, please send all correspondence to the project email address:

harrington_dam@thamesriver.on.ca

For further information please contact:

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