

Parkhill Hydro Generating Station Class EA



March 21, 2018

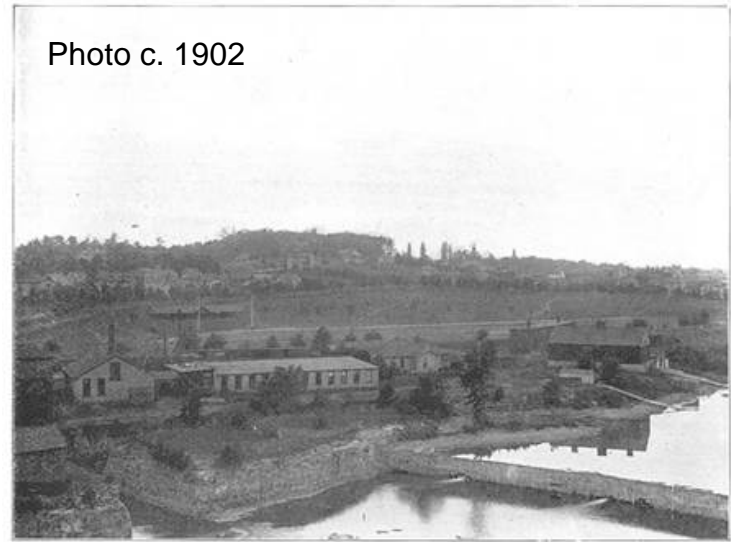
Grand River Conservation Authority



History of Parkhill Dam

- The original dam was built in 1839 by John Cain, who was hired by Robert Dickson. A canal was dug along the east bank of the river to harness water power needed for several mills.
- A new concrete dam was constructed in 1939 as the previous wooden dam had been damaged by ice.
- Parkhill Dam is part of the Grand River Canadian Heritage River Designation.

Photo c. 1902



DICKSON PARK FROM C.P.R. HILL.

Photo c. 1989



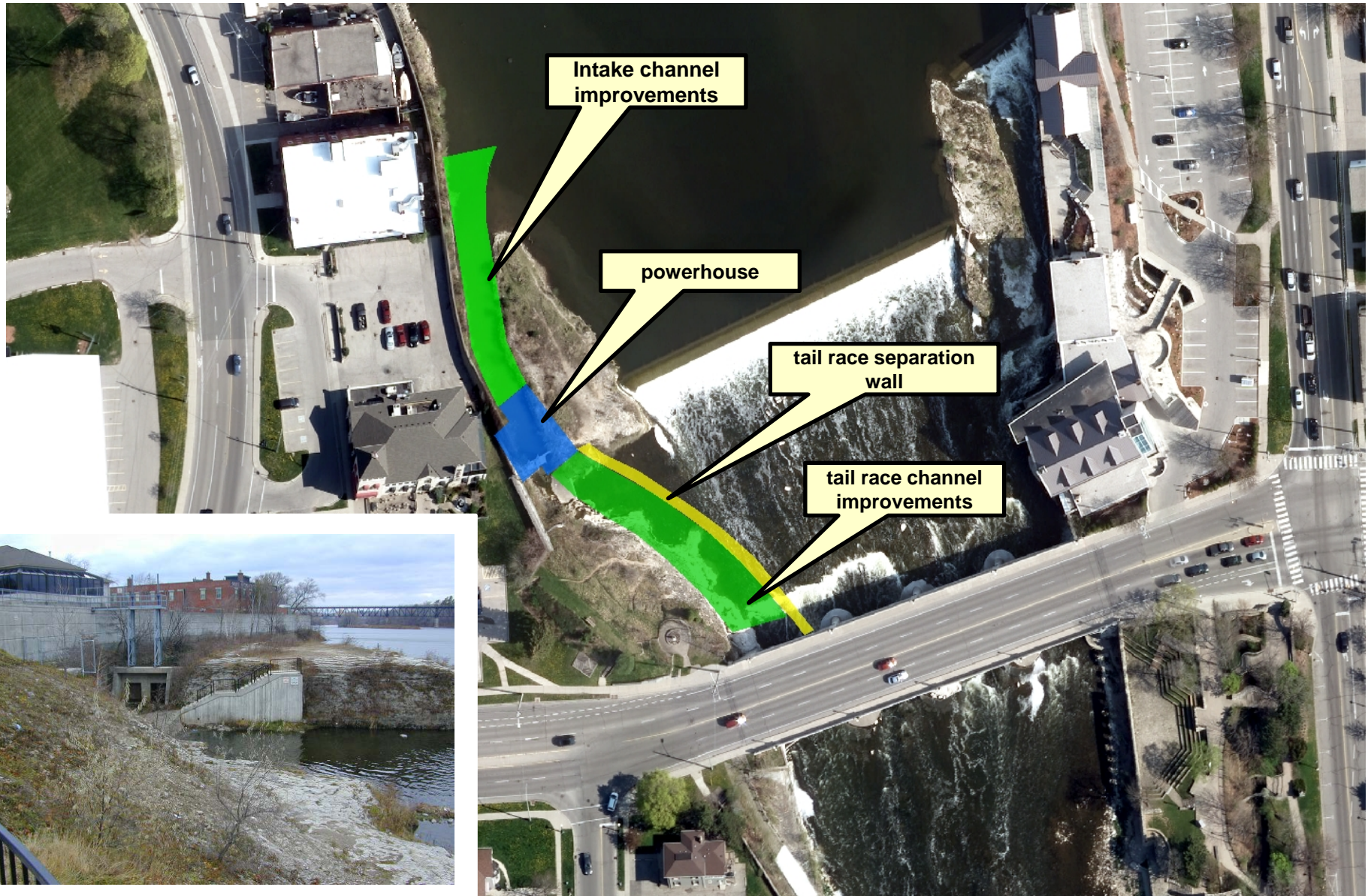
Chronology

Year	Historical Event
1784	The Haldimand Treaty of 1784 was signed, granting approximately 950,000 acres to the Six Nations who were displaced during the American Revolution.
1798	Col. Joseph Brant deeds what would become North and South Dumfries to Philip Stedman.
1811	The late Philip Stedman's sister, Mrs. John Sparkman, conveys the land to the Honourable Thomas Clarke, of Stamford, Lincoln County.
1816	The Honourable William Dickson purchases the land from Hon. Thomas Clarke. Dickson hired Absalom Shade to develop the land who in turn founded Shade's Mills.
1819	Township of Dumfries' survey is completed.
1827	Shade's Mills changes its name to Galt.
1839	A dam is constructed near the current location to feed a growing milling complex on the east bank of the river. The dam is constructed by John Cain from Montreal.
1843	Dickson gristmill is constructed.
1857	Galt is incorporated as a town.
1861	The first post office is constructed.
1878	The Empress of India, a 35-foot miniature steam paddle wheeler wrecks over the dam. 8 lives are lost (Quantrell, 2010).
1910	Original wooden dam damaged by ice
1913	Extant main concrete dam structure constructed by Galt Gas and Light Company.
1915	Galt is incorporated as a city.
1931	CNR Overpass is built.
1933	Queen Street Bridge (Parkhill) is reconstructed.
1973	The City of Cambridge is incorporated, amalgamating Galt, Preston, Blair, and Hespeler.
1974	A major flood impacted Galt, fueling the need for the development of the Living Levee.
c. 1975	Scroggins Shoe Company building demolished.
1979	The current sluice control gate is constructed.
1998	Mark Gage and Constable David Nicholson pass away after being trapped by the dam.
2003	Parkhill Bridge widened to four lanes.

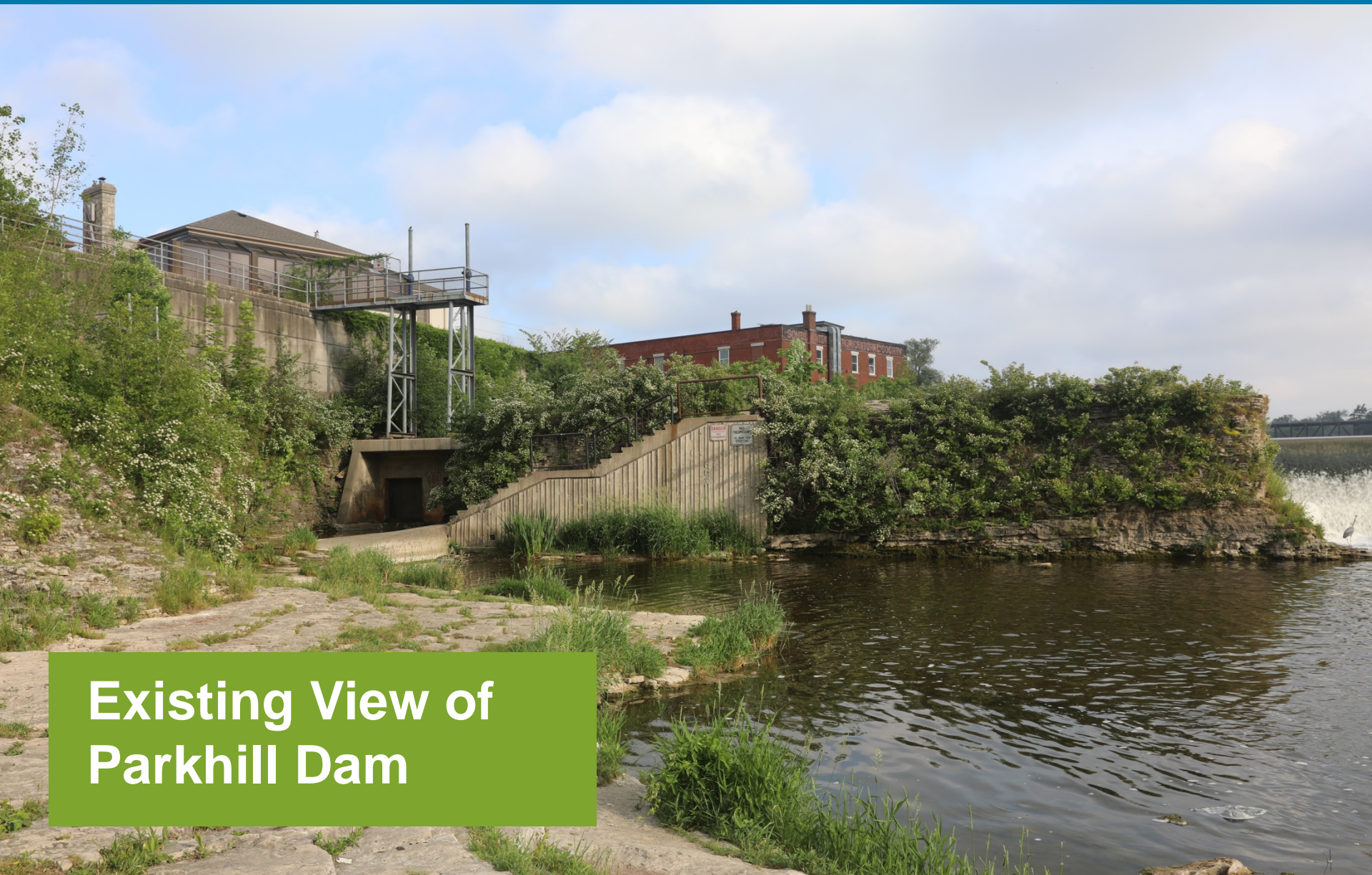
Aerial View of Site



Proposed Facilities



Conceptual Design



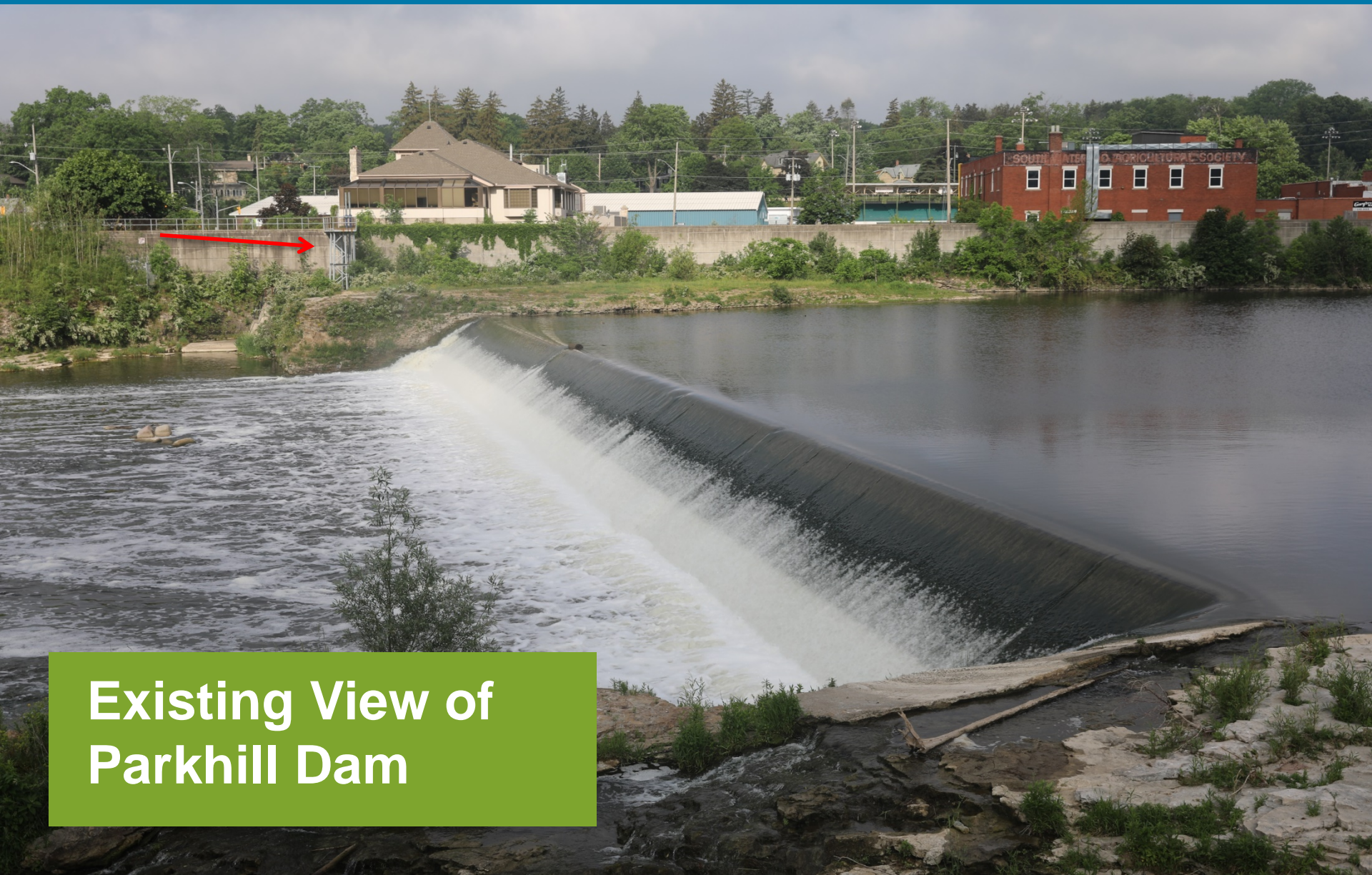
**Existing View of
Parkhill Dam**

Conceptual Design



Conceptual Design
of Parkhill Hydro GS

Conceptual Design



Existing View of
Parkhill Dam

Conceptual Design

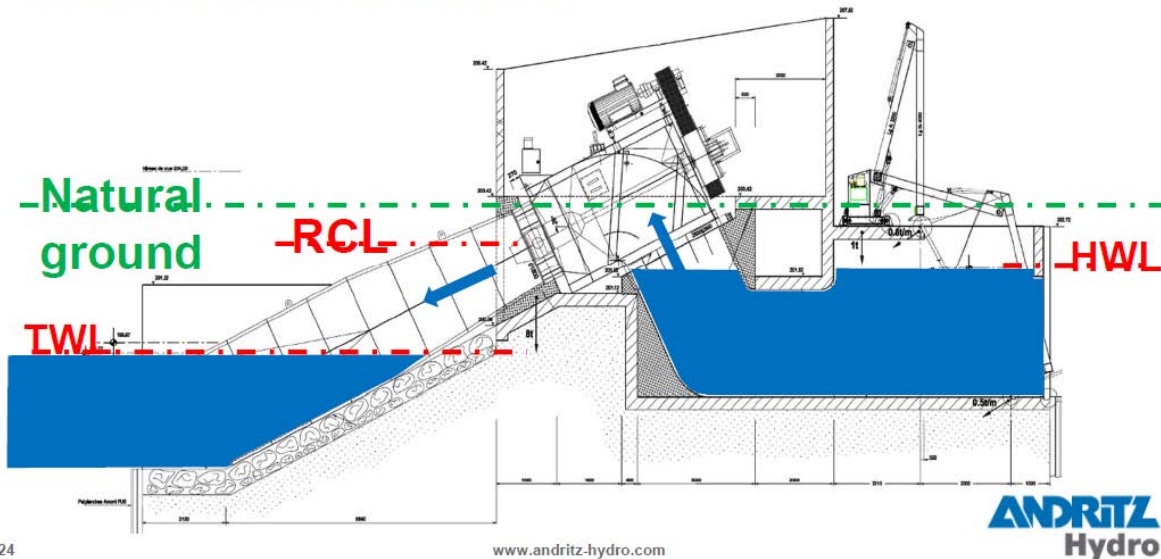


Conceptual Design
of Parkhill Hydro GS

Turbine Selection

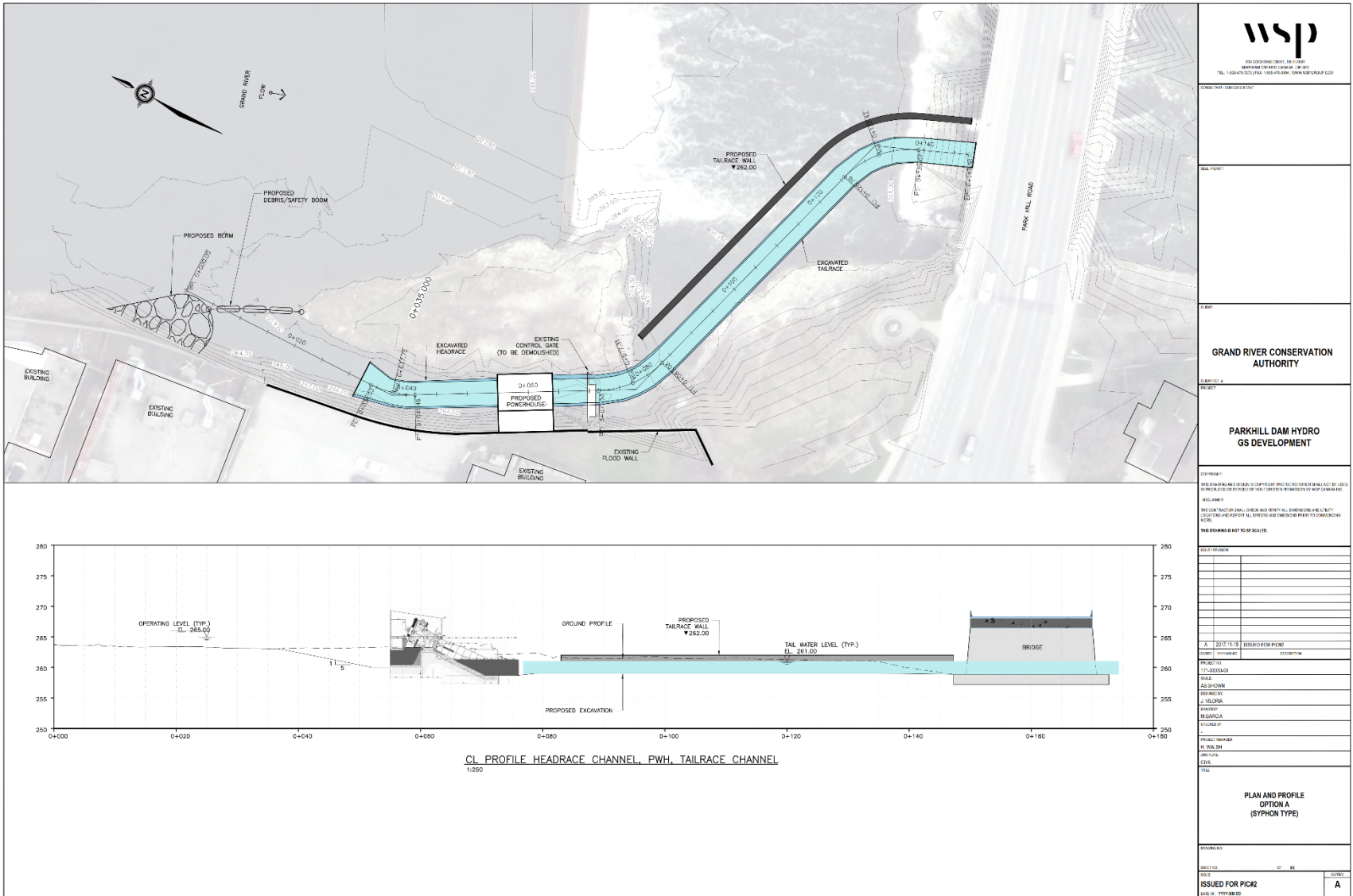
Benefits of that configuration

- Runner Center Line (RCL) above Head Water Level (HWL) with siphon : decrease of excavation works, no need of gates for maintenance or control

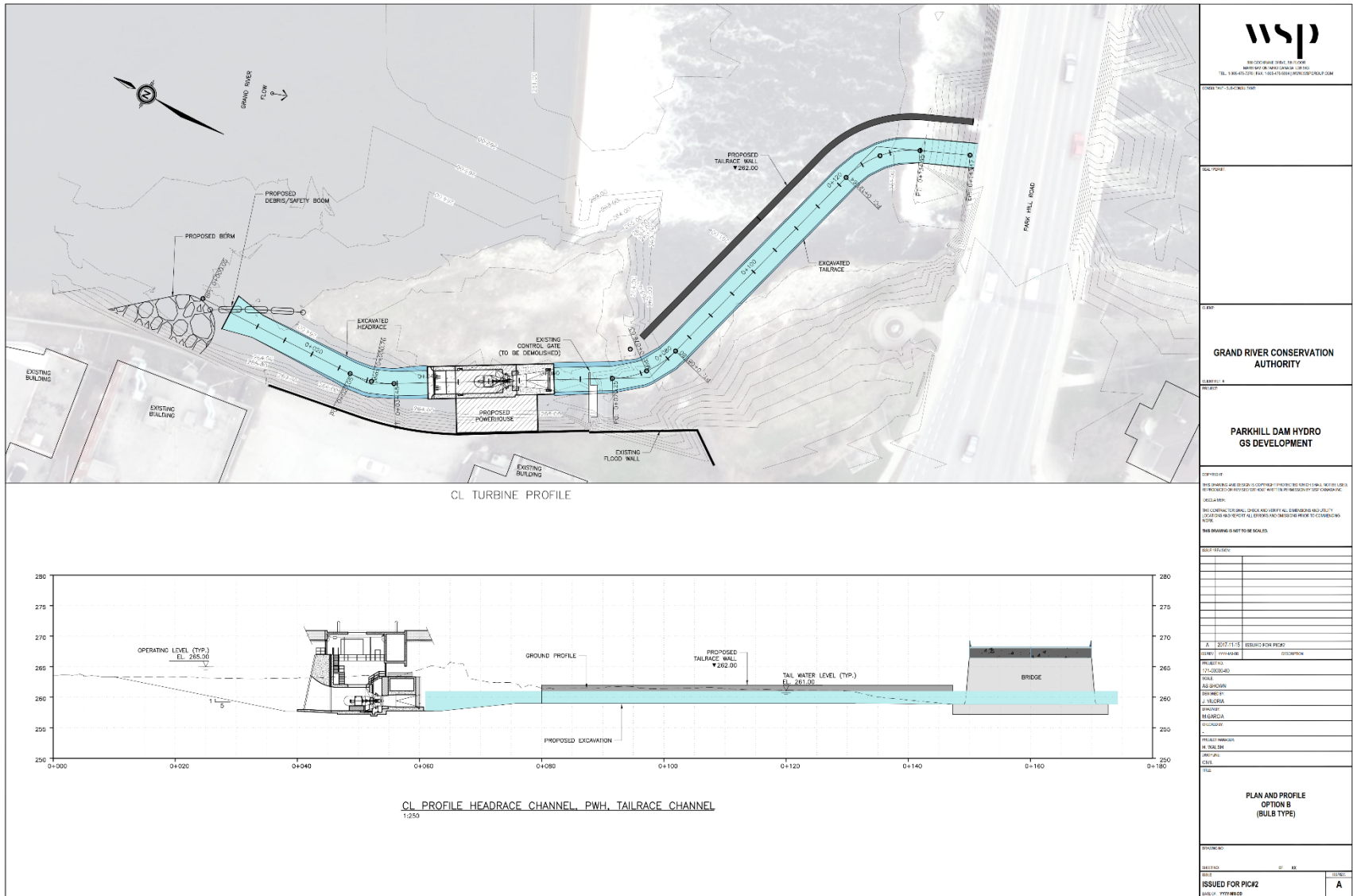


- As part of the environmental assessment, we are investigating fish friendly turbines or ways to discourage fish entry into the headrace channel.
- The low head Kaplan turbines are considered fish friendly (i.e. they do not cause Gas Bubble Disease in fish).
- Rotation is slow enough that it also reduces the likelihood of hard impact to the fish.

Proposed Facilities Option A

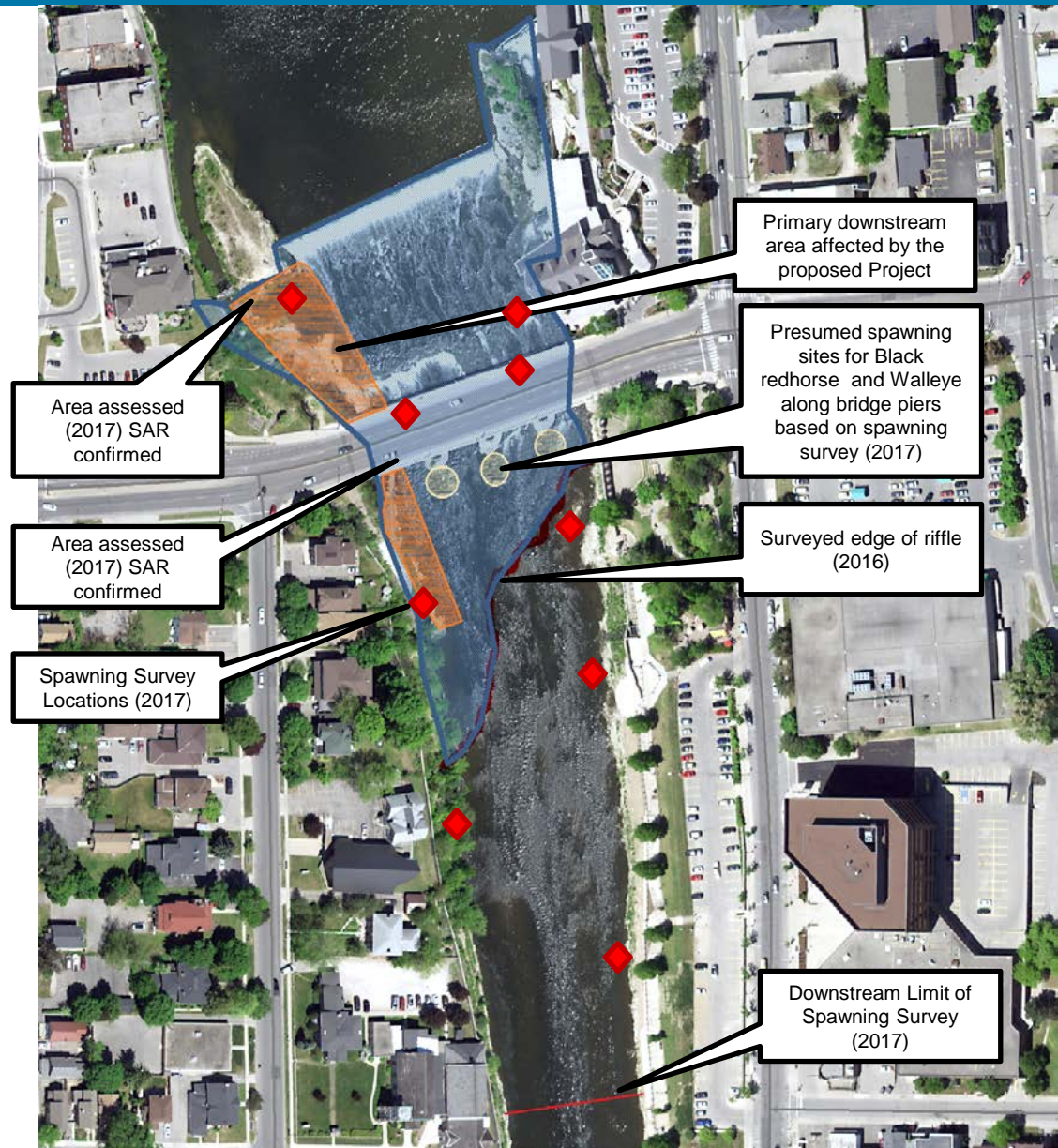


Proposed Facilities Option B



Ecological Studies

- Spawning Survey
 - Vegetation Survey
 - Terrestrial Survey
 - Habitat Assessment
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- Species at Risk found in various reaches of study area
 - Silver shiner
 - Black redhorse
 - Wavy-rayed lampmussel



Ecological Studies

- Targeted surveys for aquatic species including Walleye, and Black redhorse
- Habitat screening for Silver shiner and Wavy-rayed lampmussel
- Searches for lampmussel



Ecological Study Results



- Silver shiner and Black redhorse confirmed in tailrace area. Redhorse assumed to be spawning behind bridge piers.
- Lampmussel found in riffle below tailrace.

Extent of Changes

- Excavation of the tailrace will result in the permanent alteration of approximately 220 m² of existing channel bed and approximately 290 m² of existing bedrock outcroppings.
- The bedrock outcroppings will form part of the tailrace. Limited removal of riparian vegetation on bedrock outcroppings will occur.
- A berm will be constructed between the tailrace and the main flow path below the dam

Preliminary Environmental Impacts

Fish Habitat & Species at Risk: Next Steps

Federal Department of Fisheries and Oceans (DFO)

- In-water works required for the excavation of the tailrace area may result in harm to fish and fish habitat. This will require a review of the project proposal by the DFO under the *Fisheries Act*.
- It is not certain if DFO will require an Authorization, however similar works carried out for the Parkhill Bridge previously required an Authorization.

Ministry of Natural Resources and Forestry (MNR)

- The confirmed presence of three aquatic Species at Risk in the vicinity of the dam require review for potential permitting requirements as per the provincial *Endangered Species Act*.
- An Information Gathering Form (IGF) and potential Avoidance Alternatives Form (AAF) are required for this review. More details on the extent, timing and construction method of the proposed in-water works are required as part of this submission.
- If a permit is required, overall benefit plans and monitoring schedules will be designed in consultation with the appropriate agencies.

Fish Passage

- The GRCA and MNRF developed the Grand River Fisheries Management Plan in 1998. Representatives from the community, fishing groups, First Nations, various agencies, universities and others helped write the plan, which describes the current state of the fishery and steps that can make it better.



EXCERPT:

Penman's Dam (Paris) vs Parkhill Dam (Cambridge)
Achievement of the various fish community objectives for several sections of the Grand River watershed is dependent upon a partition being in place to separate migratory trout from resident fish communities.

The Parkhill Dam, Cambridge can perform this function.

Hydro Capacity

- Proposed plant design flow capacity of 15 m³/s - equivalent to the flow that occurs on average 82% of the time.
- Normal summer low flow is approximately 15 m³/s.
- Approximately 4.3 meters of gross operating head.
- Proposed design calls for one turbine producing 0.5 MW of capacity.
- During summer low flow periods, a minimum flow will be maintained over the main dam, currently a minimum flow of 4 m³/s is being considered to be maintained over the dam. This flow was simulated on December 19 & 20, 2017.

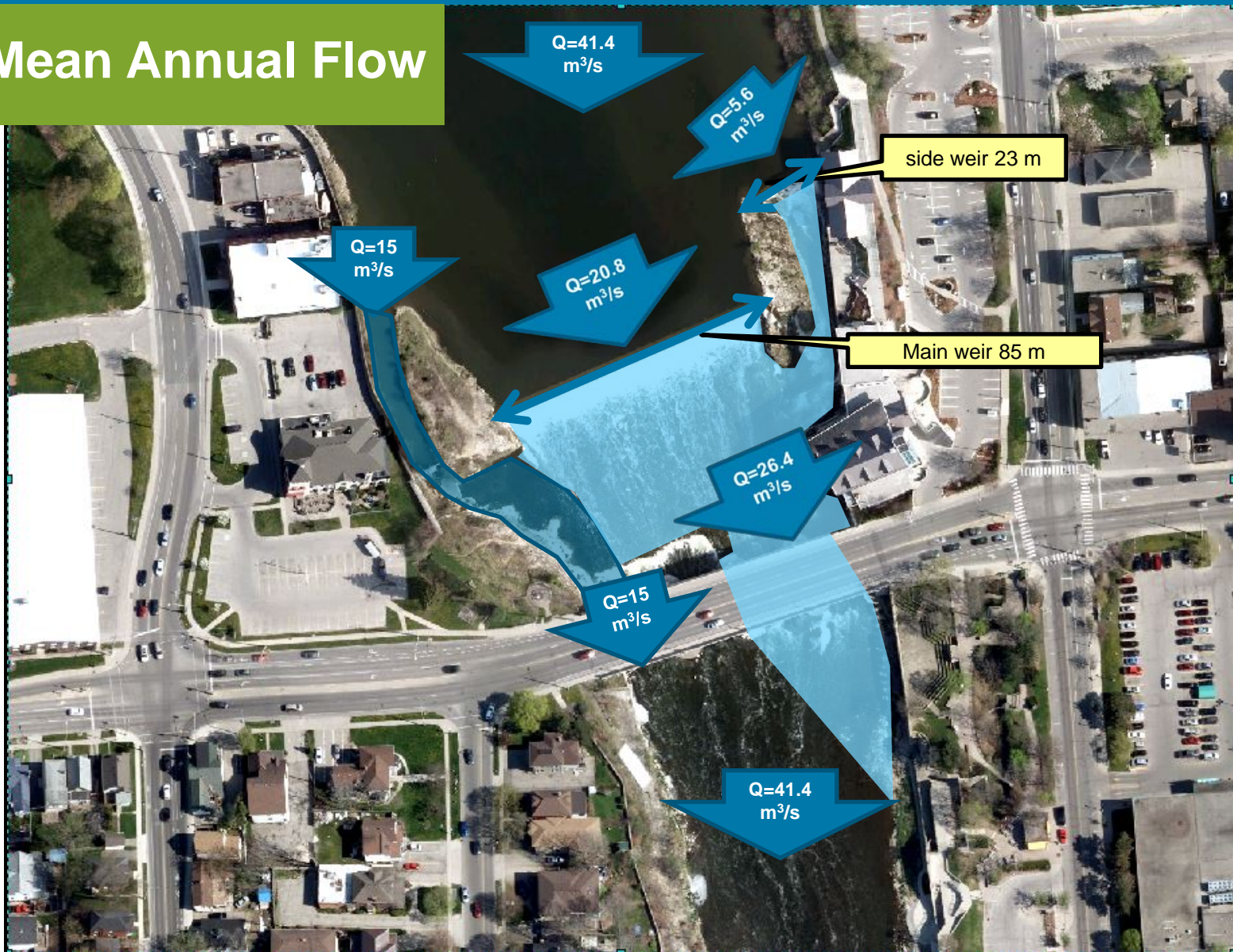
Existing Condition

Split Mean Annual Flow



Proposed Condition

Split Mean Annual Flow



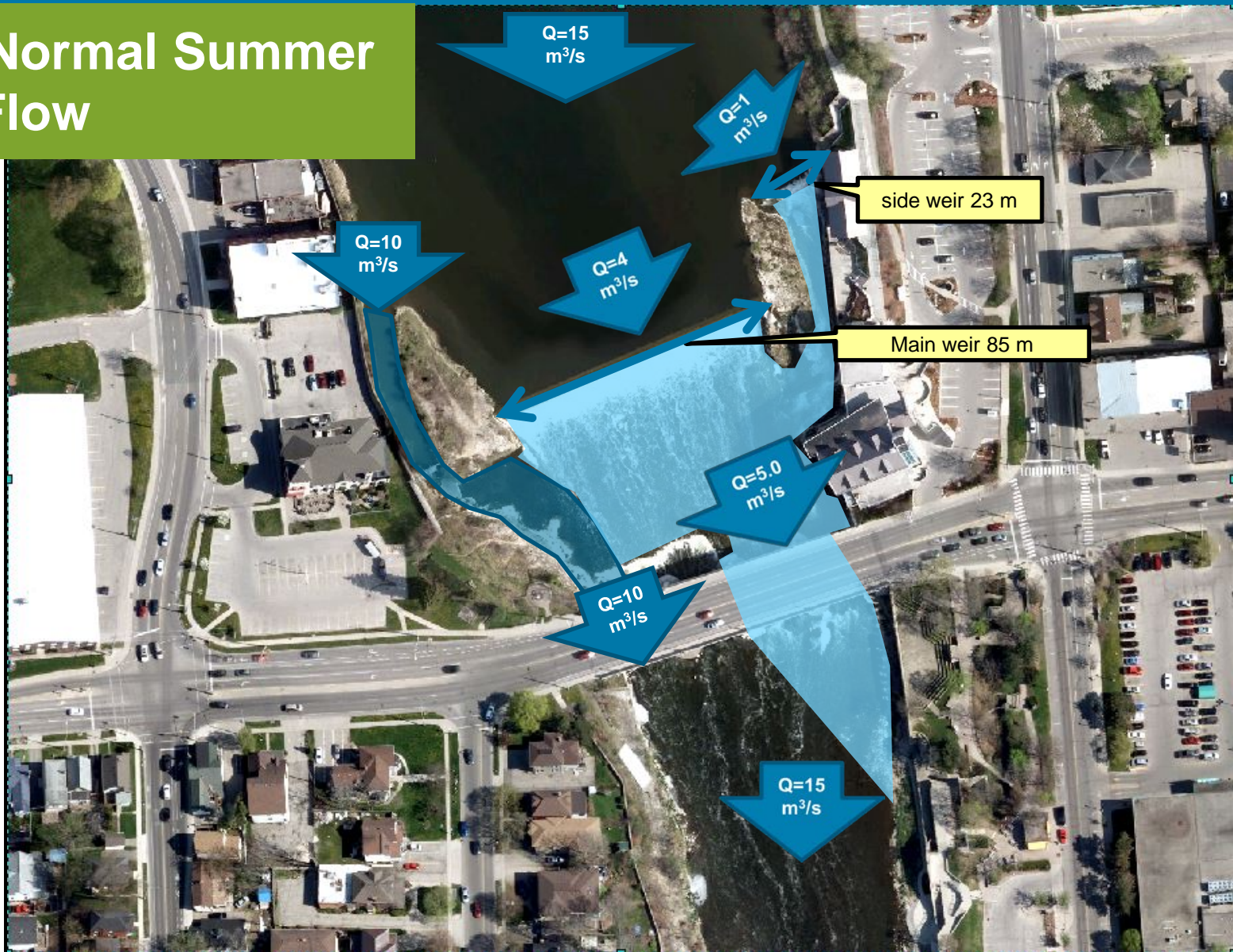
Existing Condition

Split Normal Summer
Low Flow



Proposed Condition

Split Normal Summer
Low Flow



Existing Survey Data


Parkhill Dam Hydro
Site Plan

Map 1

Parkhill Dam Reach
Survey Data



1:2,000



Crest of riffle illustrated in red controls distribution of flow across the river under existing conditions.

Grand River Parkhill Reach



Parkhill Dam Hydro
Site Plan

Map 2

Study Reach
for UAV Survey
and Photography



1:2,000

The portion of the river most affected by the development of Parkhill hydro will be between the riffle and dam. More flows will be focused along the west side of the river during low flows once the hydro plant is in operation.

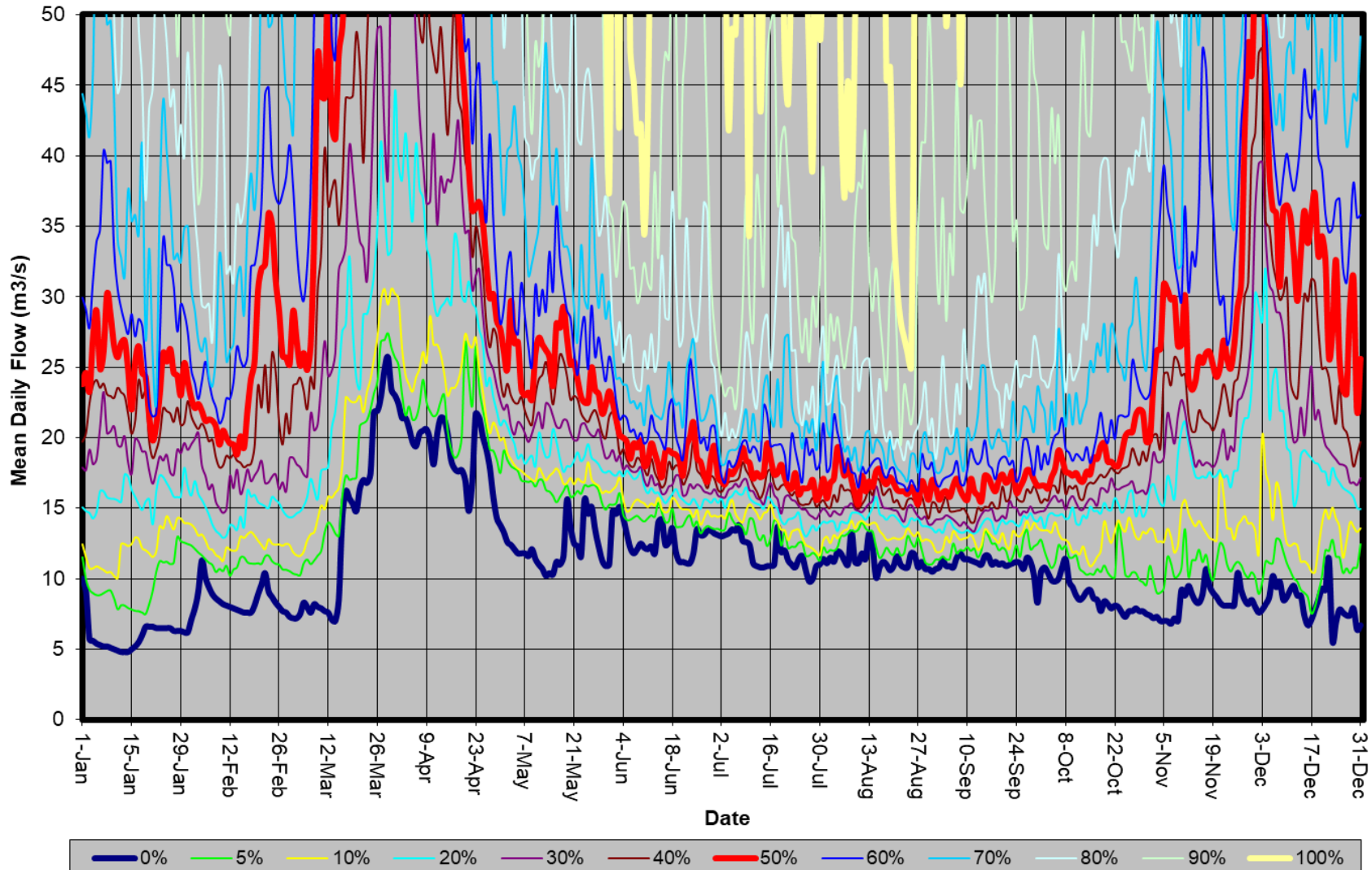
Crest of riffle illustrated in red controls existing distribution of flow across the river under existing conditions.

Simulated Low Flow



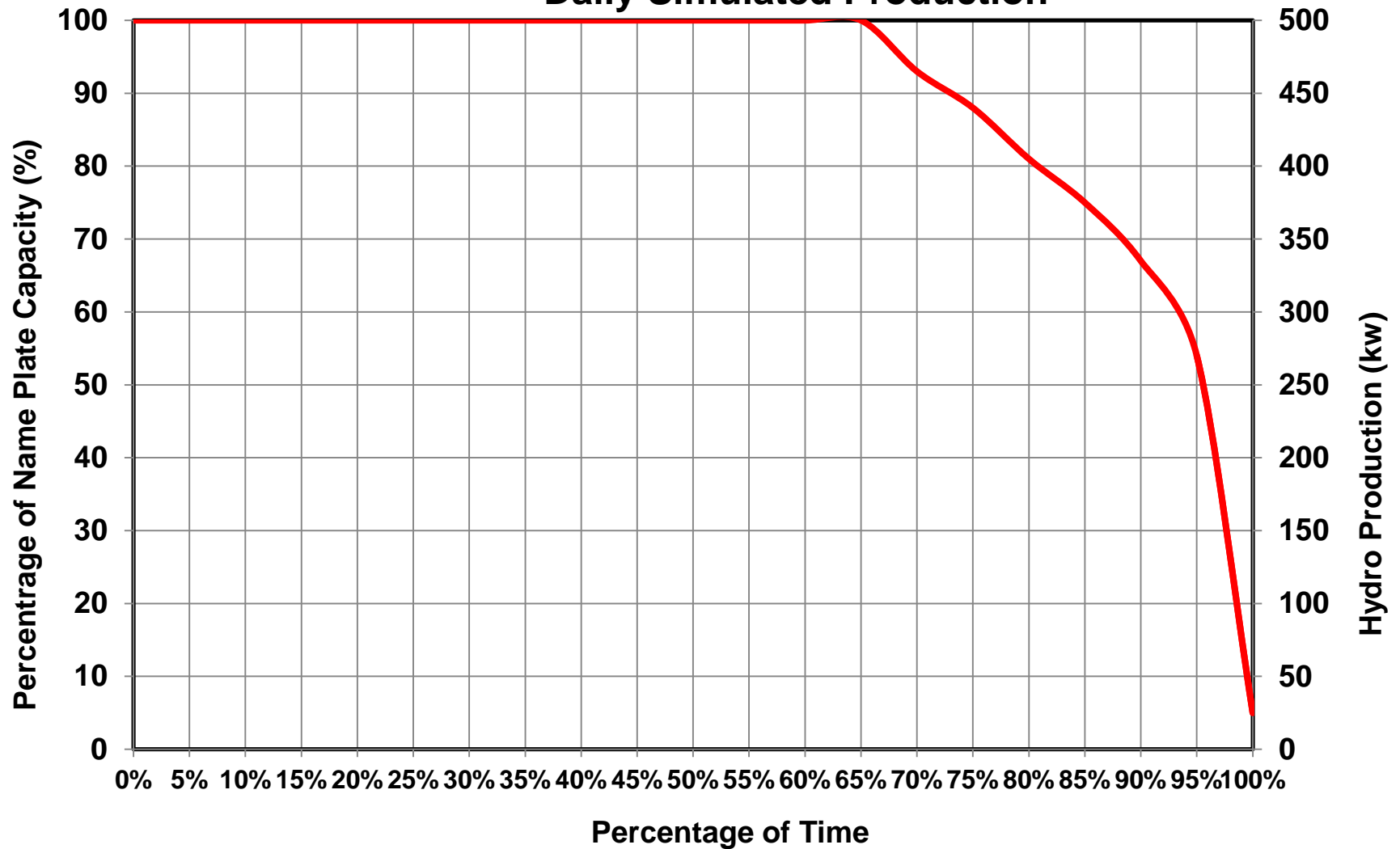
Parkhill Dam Flows

Parkhill Dam Mean Daily Flow Percentiles
1984 to 2015



Hydro Capacity

**Parkhill Hydro Plant Capacity Factor 1984-2015
Daily Simulated Production**



Further Information

If you have questions about the Parkhill dam hydro project, would like to receive information, or would like to provide feedback as part of the environmental assessment process, please e-mail parkhill@grandriver.ca.